INC

JAA77451-R.3512.A

作成承認印	配布許可印
ニコン 映像カンパニー CS推進部 GM	

AF Nikkor 24～85/2.8～4D

Ai-S

REPAIR MANUAL

Nikon | NIKON CORPORATION
Tokyo, Japan

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[1.] Specifications

1. Main specifications

Focal length :	24 ～ 85mm
Maximum aperture ratio :	1 : 2.8 ～ 4
Lens construction :	15 pcs. in 11 groups /aspherical surface G4 (PAG), G13 (PGM)
Angle of view :	135 system 84° ～ 28° 30'
	IX240 system 71° ～ 23° 00'
	Digital camera D1 61° ～ 18° 50'
Distance scale :	∞ ～ 0.5m 、 2.0ft 、0.5 ≒ 0.21m is macro indication only.
Minimum photography	0.5m (Photography magnification W : 0.06、 T : 0.17)
distance :	Macro 0.21m (Photography magnification f= 3 5 mm :
	0.28、T : 0.50)
Focusing :	Inner Focus (IF) By the 2nd lens group
A/M change :	Not used.
Aperture scale :	2.8、4、5.6、8、11、16、22
Diaphragm :	Fully automatic (Minimum aperture can be locked.)
Metering system :	Full aperture metering in CPU・AI camera body.
	Stop-down metering in conventional cameras.
Mount :	Nikon F mount
Filter :	Attachment size: 72mm (P= 0 . 7 5 mm)
Hood :	Bayonet type hood (HB－2 5)
Auto focus :	When AF camera is installed to the Nikon F mount, automatic
	focus photography is possible. (F3AF is excluded.)
Tripod socket :	Not used.
Dimension :	78.5mm (max. dia.) ×82.5mm (length) 93.5mm (max. length)
Weight :	560 g
Others :	Accessories which cannot be installed (because the mount contact section of lens interferes)
	Auto extension ring PK-1、PK-11
	K ring K1
	Bellows automatic ring BR-4

INC

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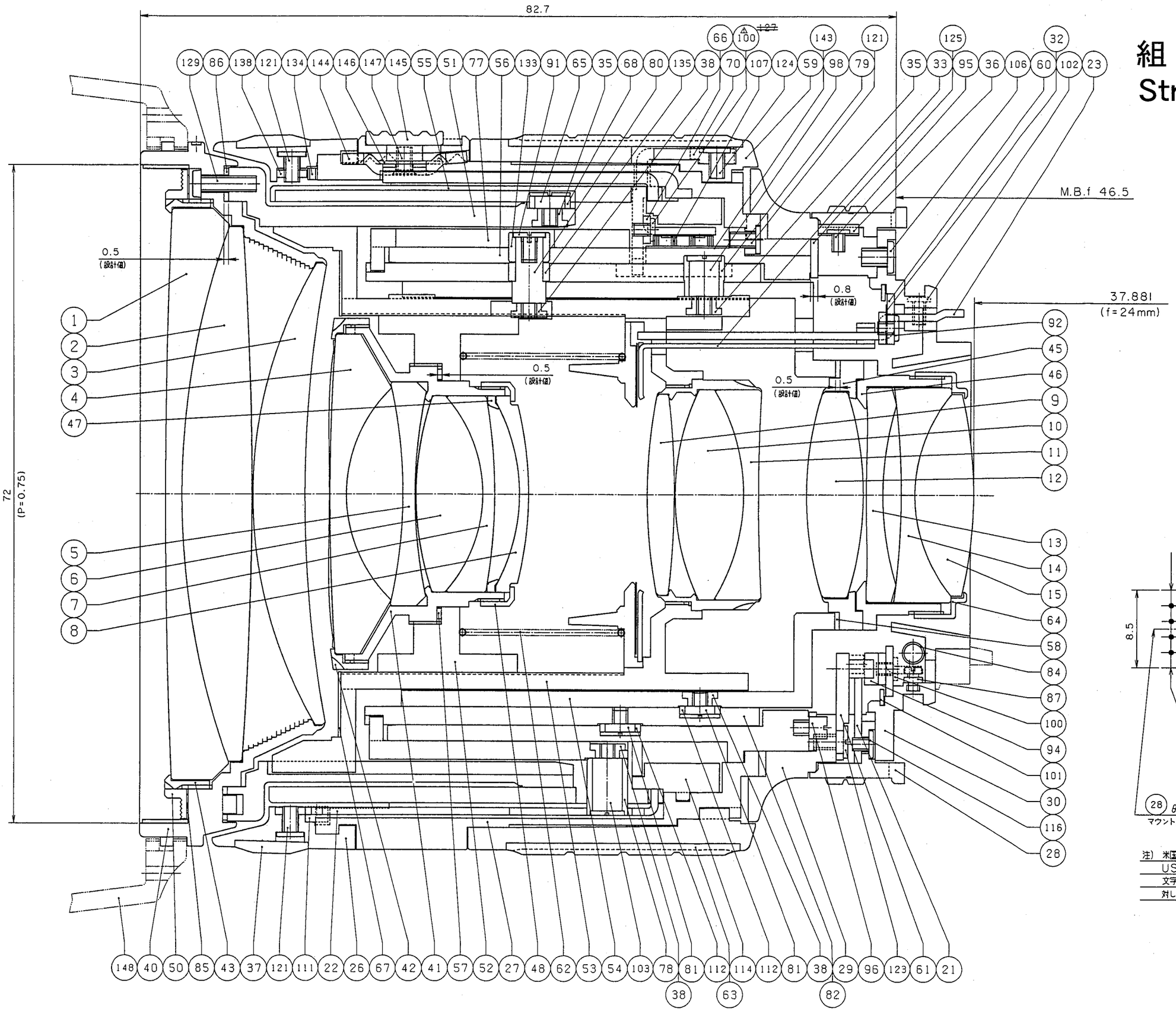
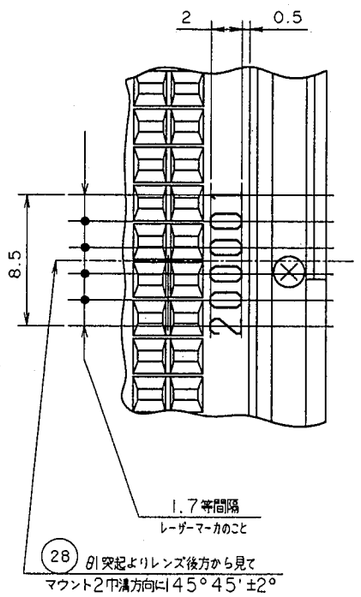
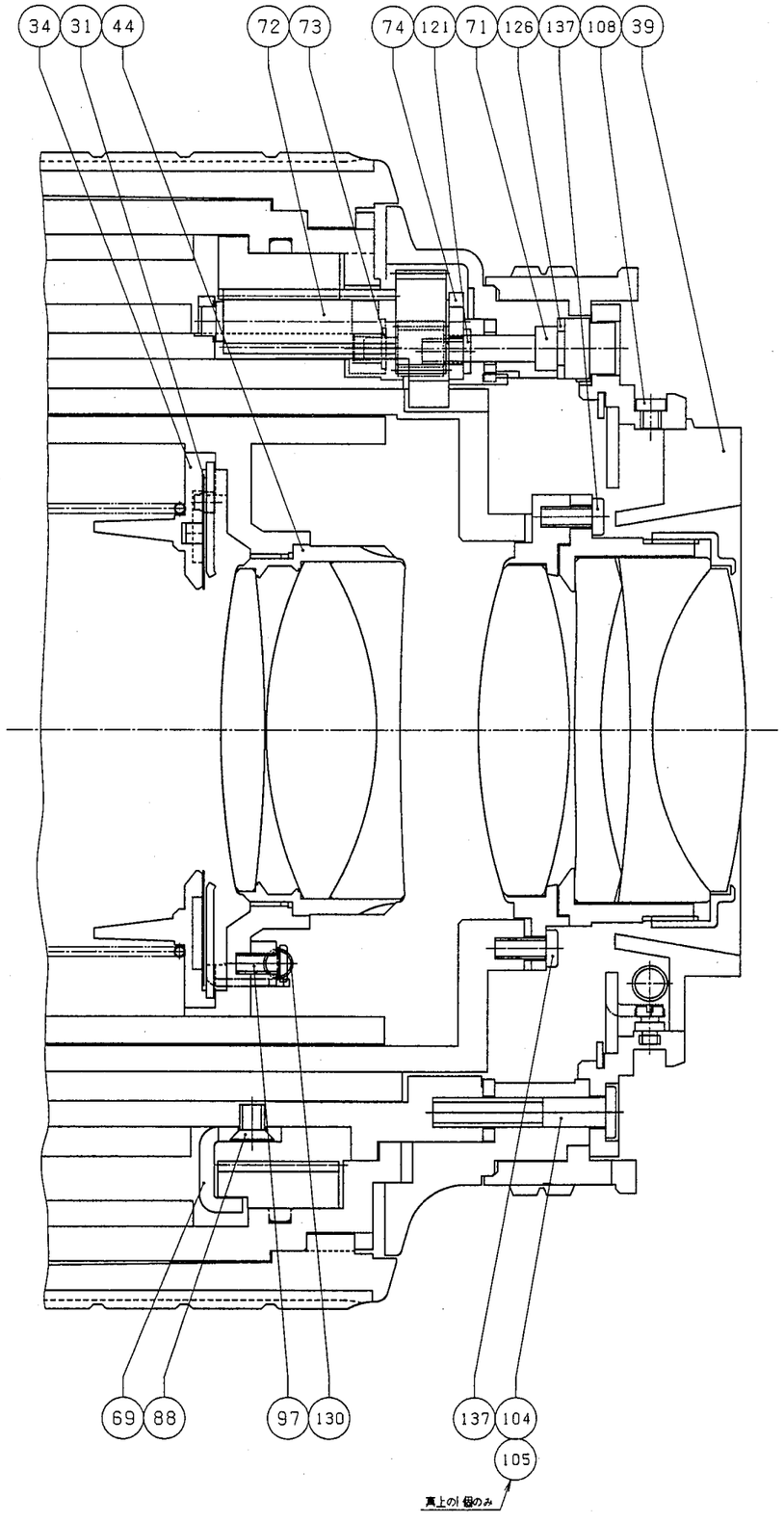
組 立 図 / Structure of the lens





注) 米国向けは、製品No.の前に
USをレーザーマーカーのこと.
文字位置は、上図中心線に
対し、振り分けのこと.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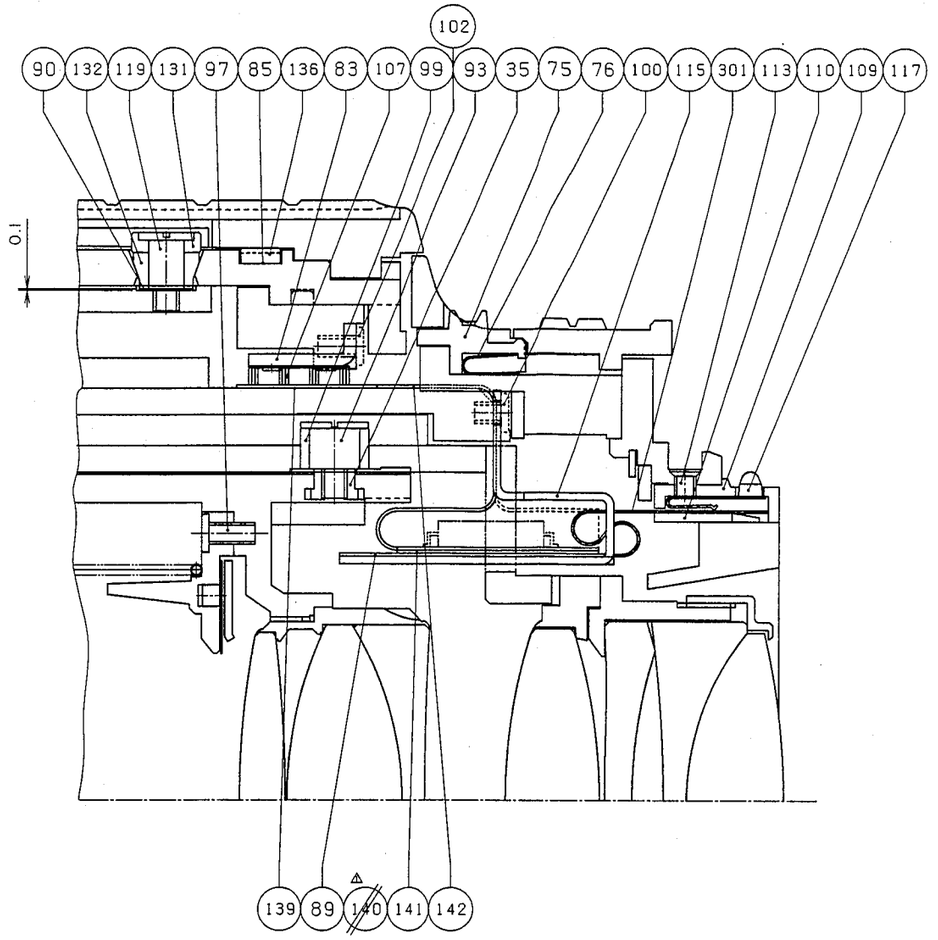
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[3.] Cautions for repair

1. Optical axis adjustment

Due to any failure mode appearing on the image if removing the 4th lens group unit from the main lens and putting the 4th lens group back onto the same position of the main lens straight away, any adjustment to the optical axis on the 4th lens group shall be necessarily performed.

If there is found any lens' optical axis to be necessarily adjusted, make sure to repair and to adjust it in any facilities the adjuster for optical axis is installed. In case it is conducted in anywhere other than such facilities, make sure to disassemble/assemble the 4th lens group unit without removing it from the main lens.

2. Lens cleaning

The aspheric lens composite type is employed for this applicable lens. Make sure to use the A-level dustcloth for cleaning on the R1 side of this applicable G4 lens.

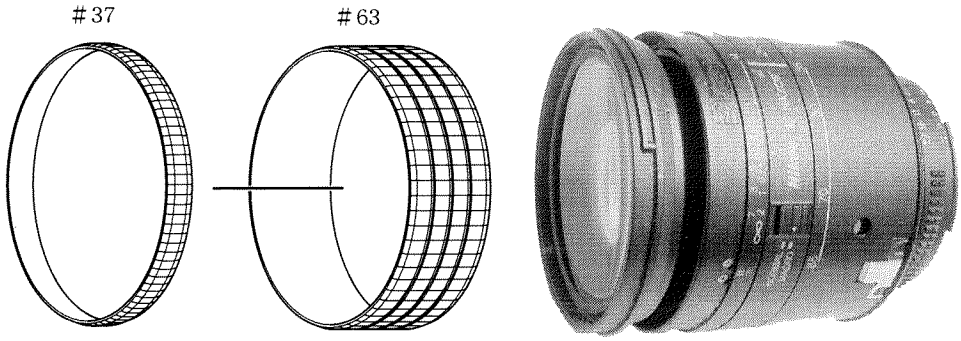
In addition, for cleaning any lens other than this applicable one, it is no problem with the conventional way to do so.

<Reference>

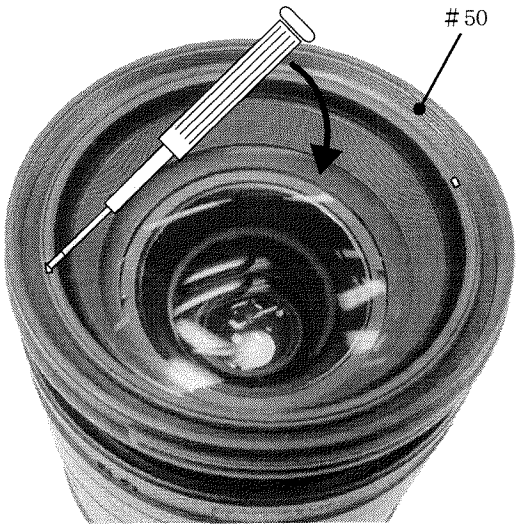
The technical information No. L (AF)-970060 shall be referable.

[4.] Disassembly

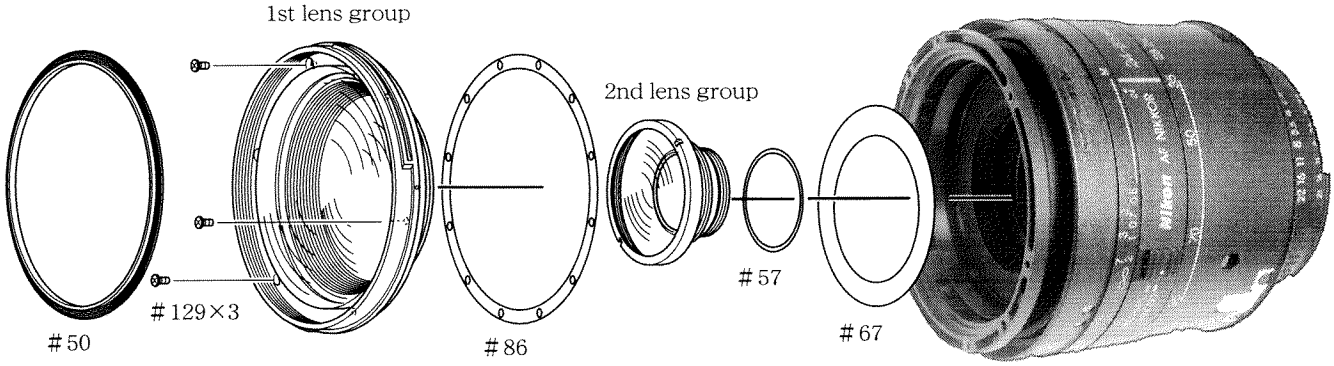
1. RUBBER RING #37、#63



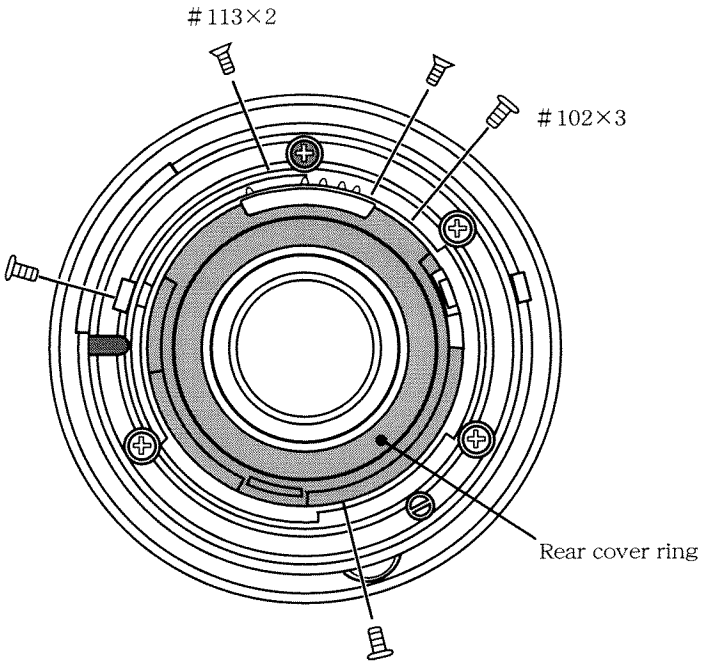
2. 1st~2nd LENS GROUP



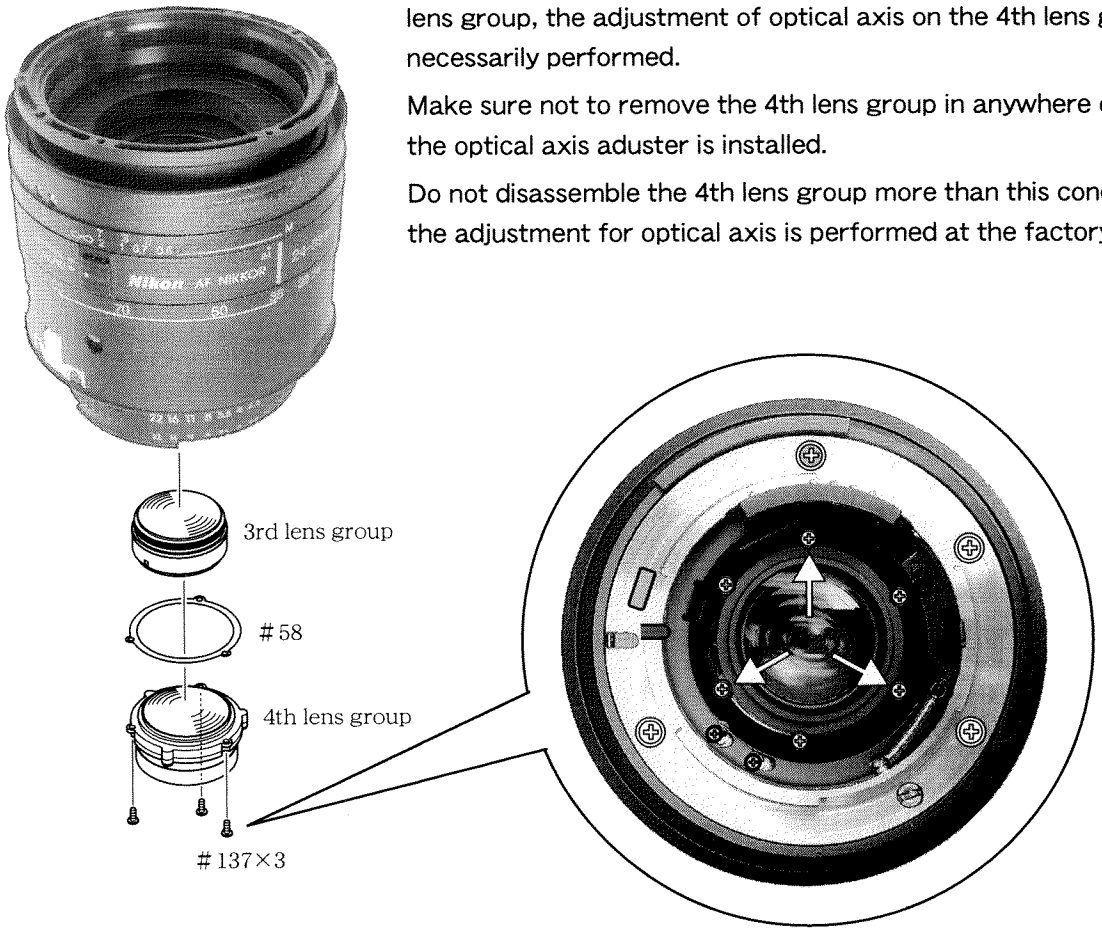
- Drop alcohol around the ring (#50).
- Remove the ring (#50). (Refer to Figure on the left.)



3. REAR COVER RING



4. 3rd~4th LENS GROUP

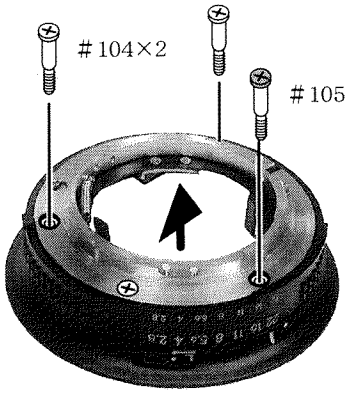


Note:At the completion of a series of repair work after removing the 4th lens group, the adjustment of optical axis on the 4th lens group shall be necessarily performed.

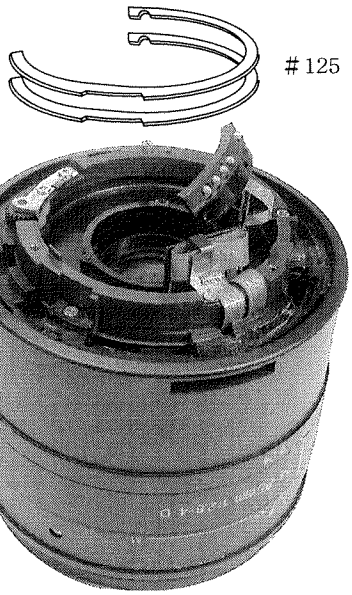
Make sure not to remove the 4th lens group in anywhere other than where the optical axis aduster is installed.

Do not disassemble the 4th lens group more than this condition. Because the adjustment for optical axis is performed at the factory.

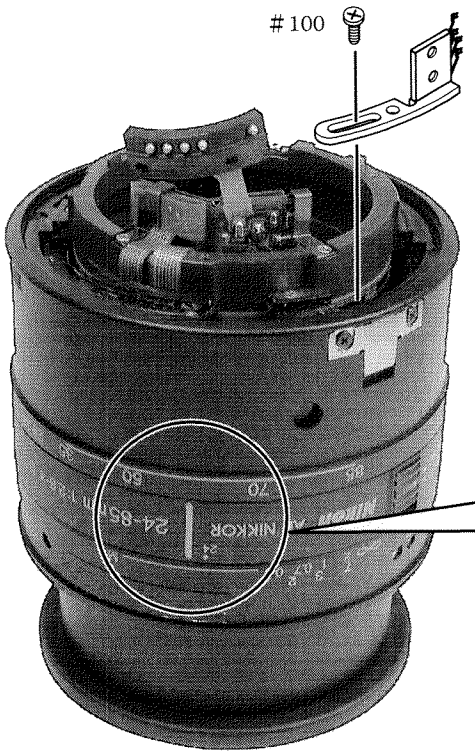
5. BAYONET MOUNT GROUP



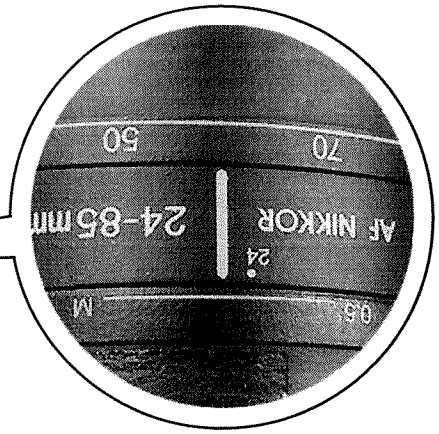
Bayonet mount group



6. ZOOM ENCODER BRUSH

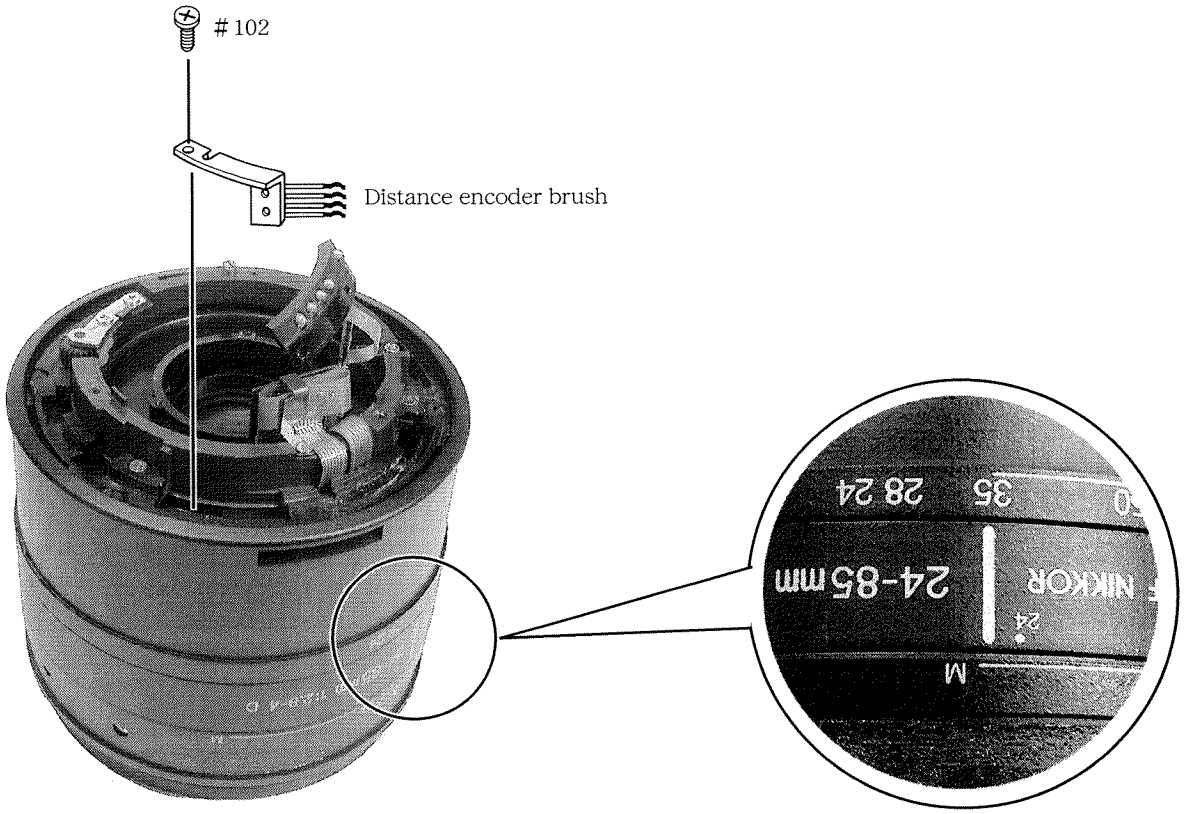


Zoom encoder brush



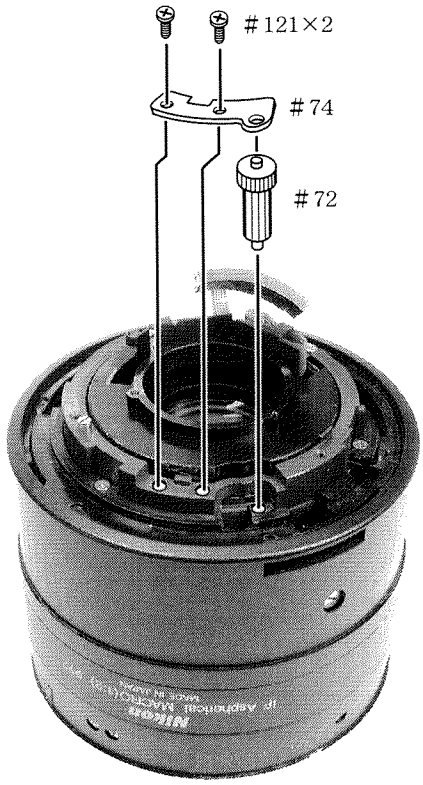
Set position of ZOOM RING and FOCUS RING

7. DISTANCE ENCODER BRUSH

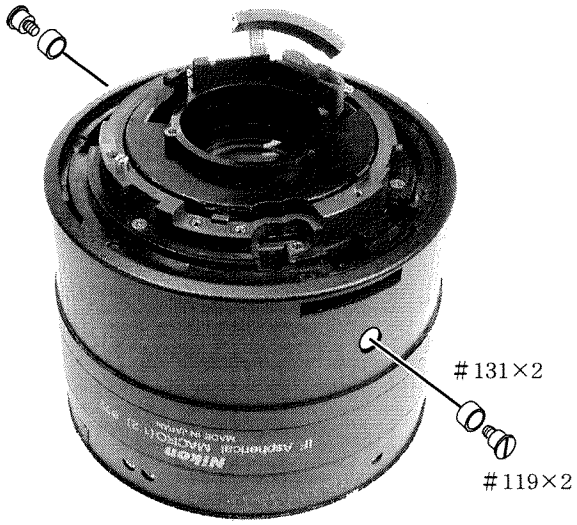


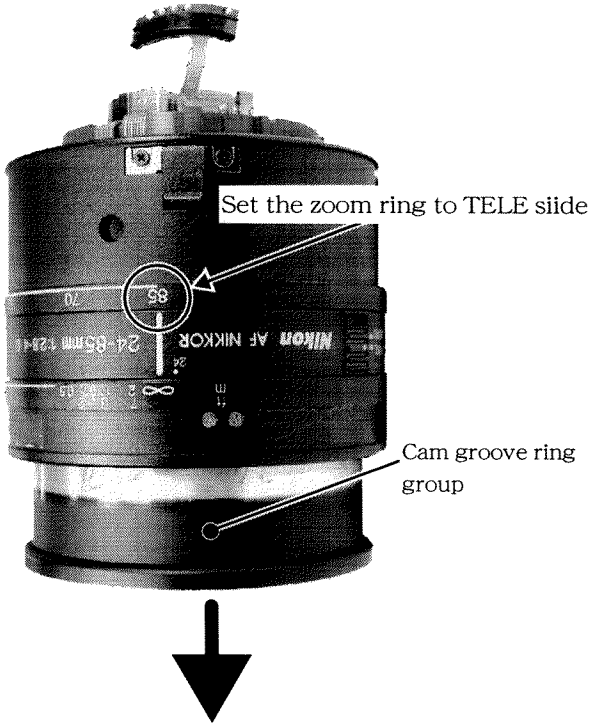
Set position of ZOOM RING and FOCUS RING

8. A F GEAR



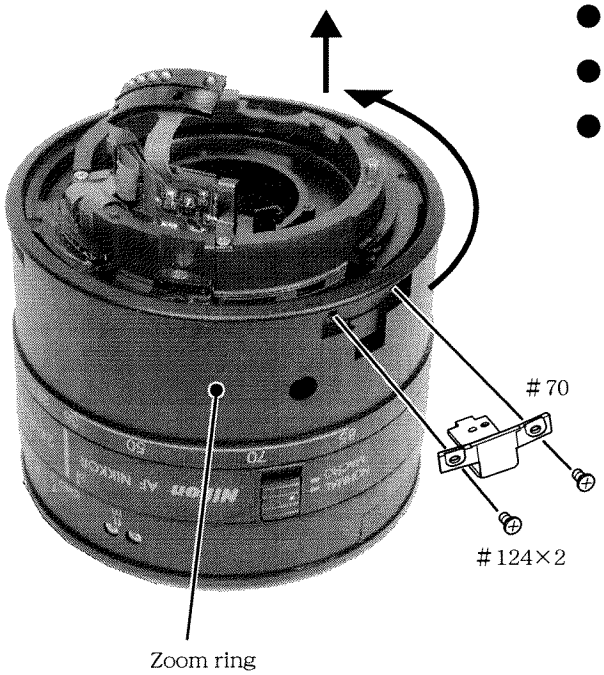
9. CAM GROOVE RING GROUP





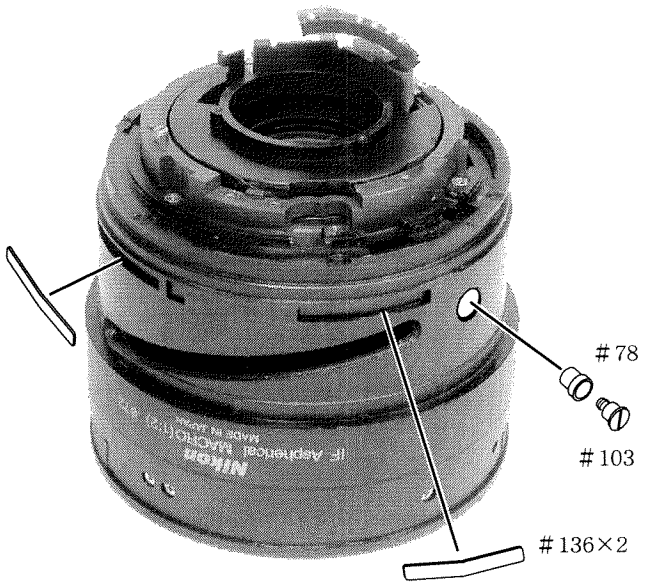
- Set the zoom ring to WIDE siide.

10. ZOOM KEY #70、ZOOM RING

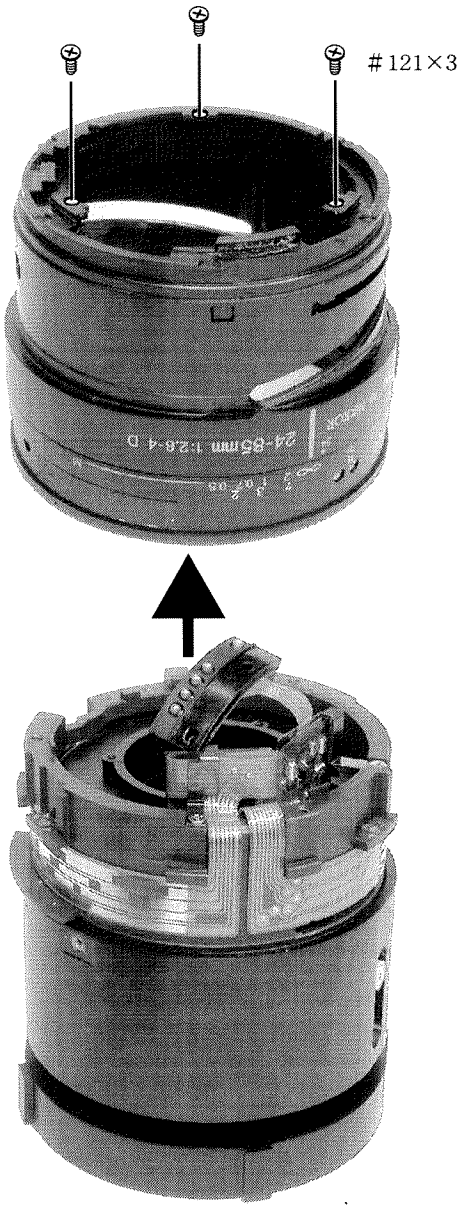


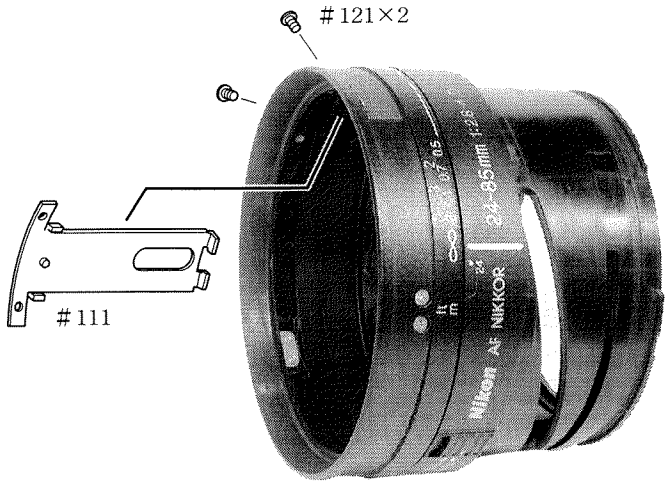
- Set the zoom ring to WIDE siide.
- Remove the zoom key #70.
- Rotate the zoom ring to counterclockwise and remove it.

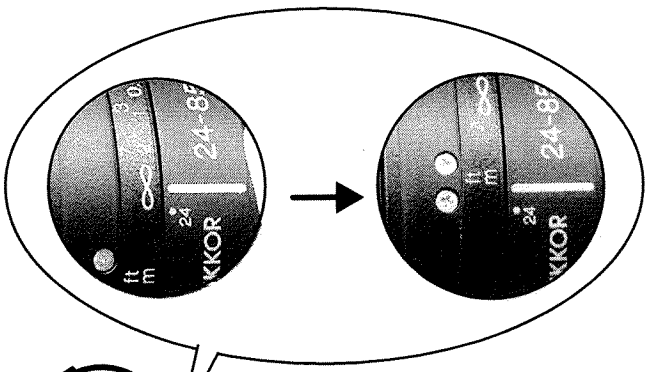
11. EXTERNAL PART



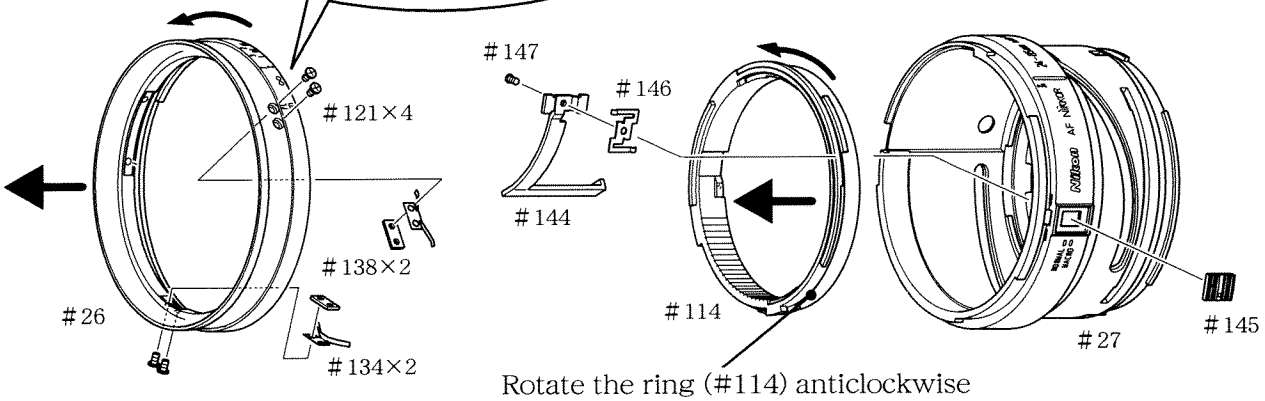
● Set the focus ring to infinity side.





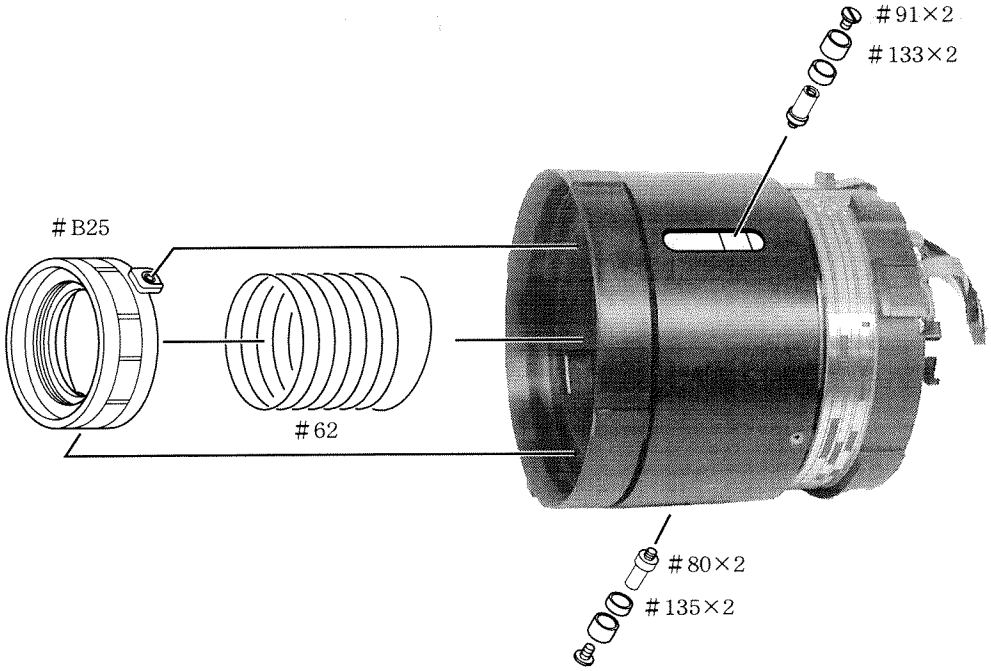


● Rotate the focus ring (#26) anticlockwise slightly from ∞ position, and then remove it in the forward direction.

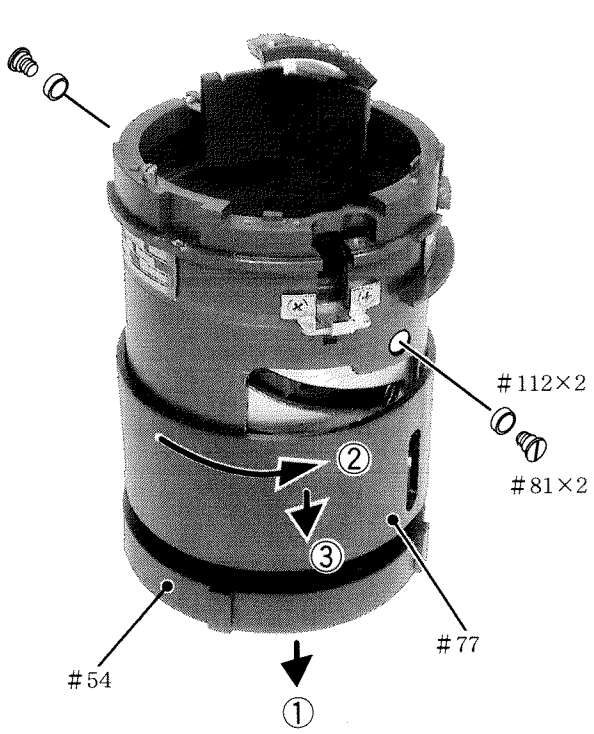


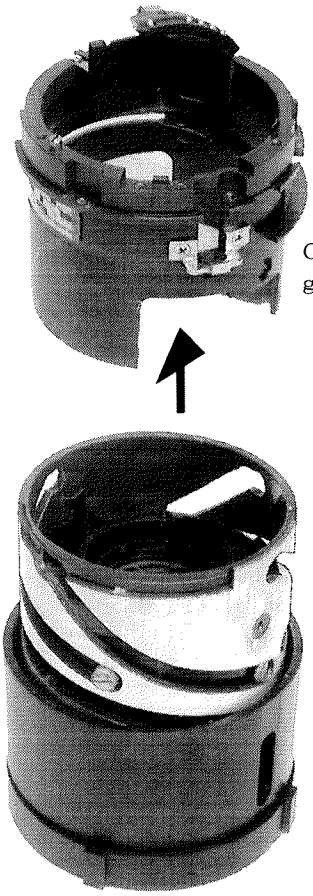
Rotate the ring (#114) anticlockwise and remove it in the forward direction.

12. 2nd LENS GROUP FRAME

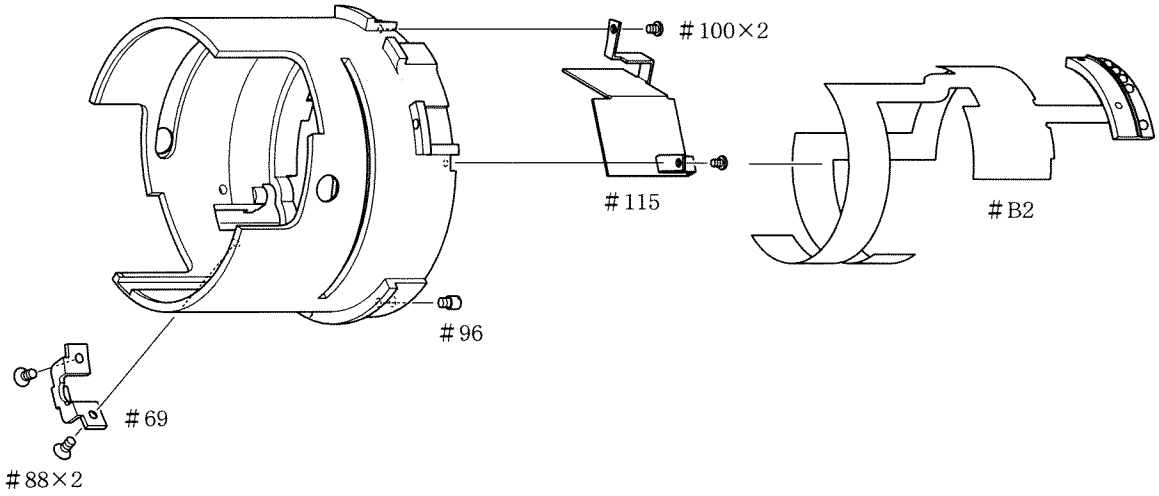


13. CAM GROOVE RING GROUP

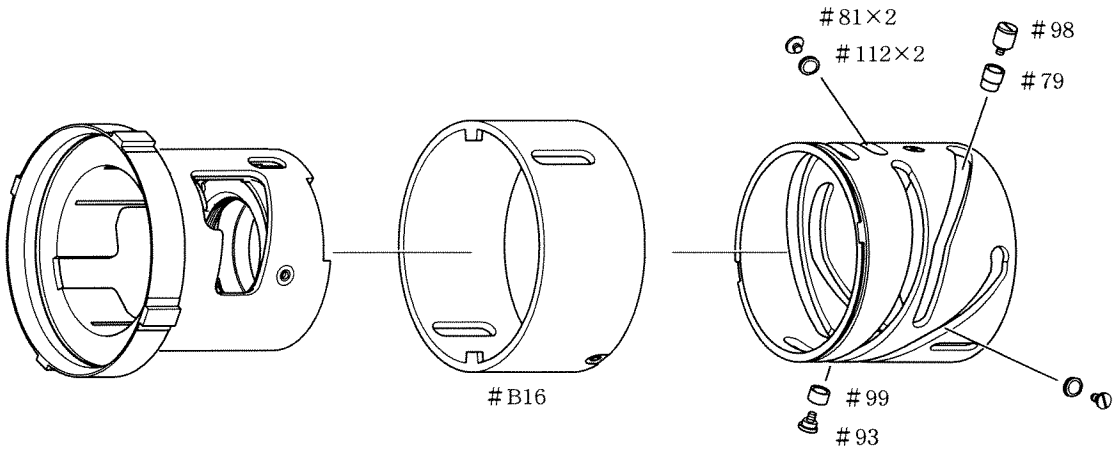




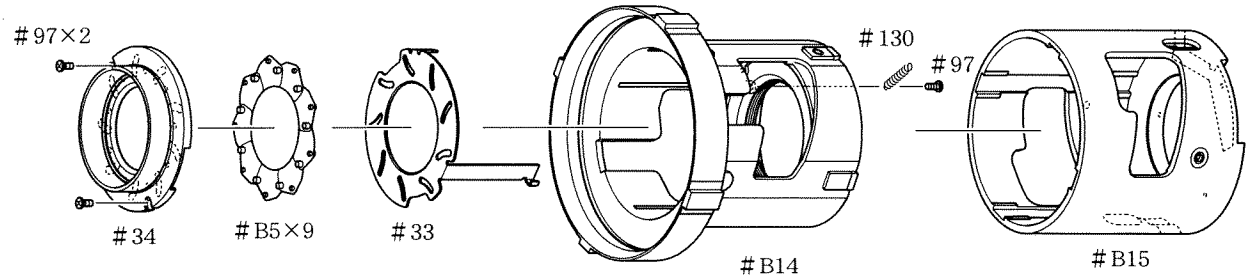
- Lower the fixed ring (#54) in the arrow ① direction.
- Rotate the ring (#77) anticlockwise slightly.
- Lower the ring (#77) in the arrow ③ direction.



14. CAM GROOVE RING

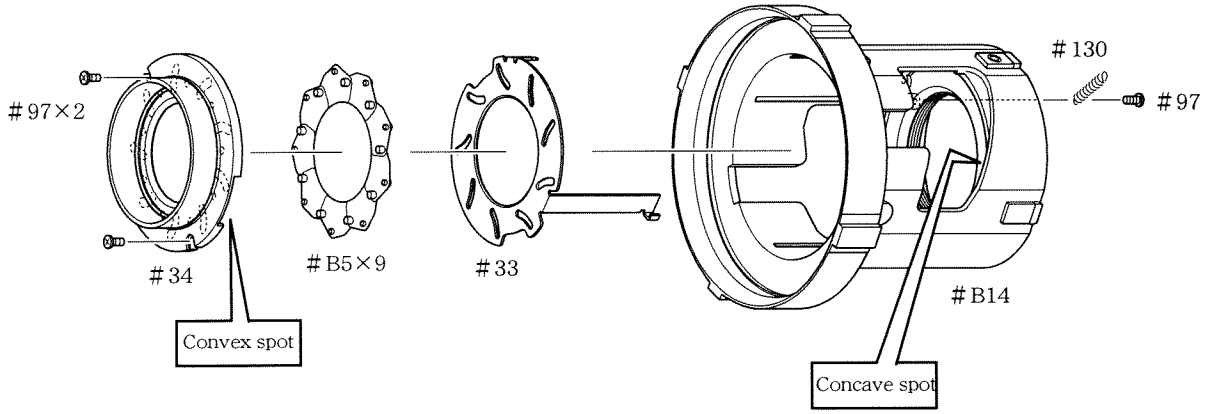


15. STRAIGHT GROOVE RING / APERTURE BLADE HOUSING GROUP



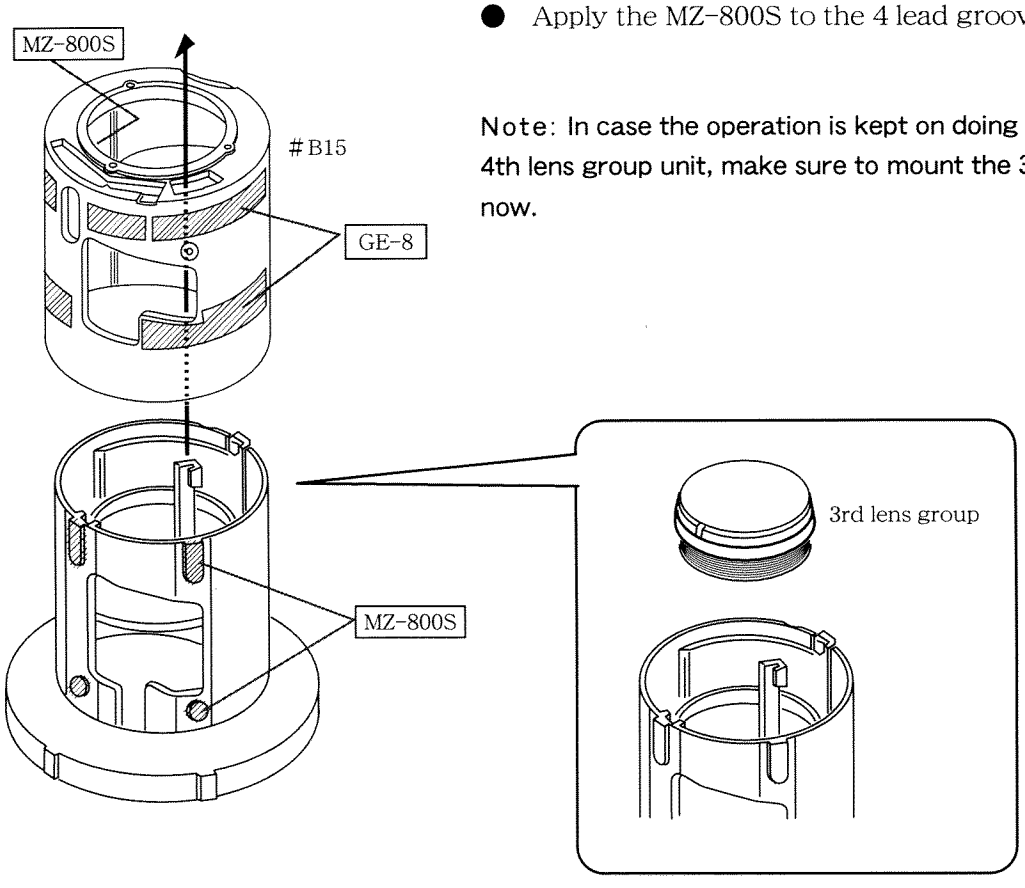
[5.] Assembly/Adjustment

1. APERTURE BLADE HOUSING GROUP



- Set the convex of the blade mounting ring (#34) to the concave inside the fixed ring (#B14), and then assemble the aperture blade room into the fixed tube (#B14).

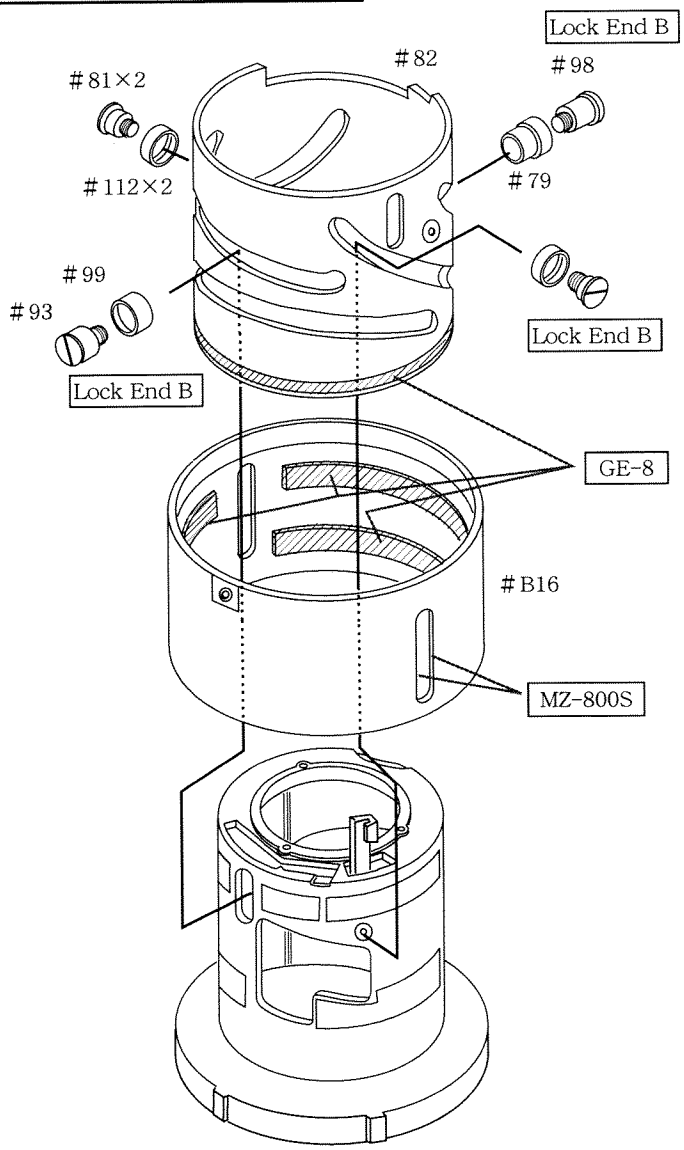
2. STRAIGHT GROOVE RING



- Apply the MZ-800S to the 4 lead grooves inside the B15.

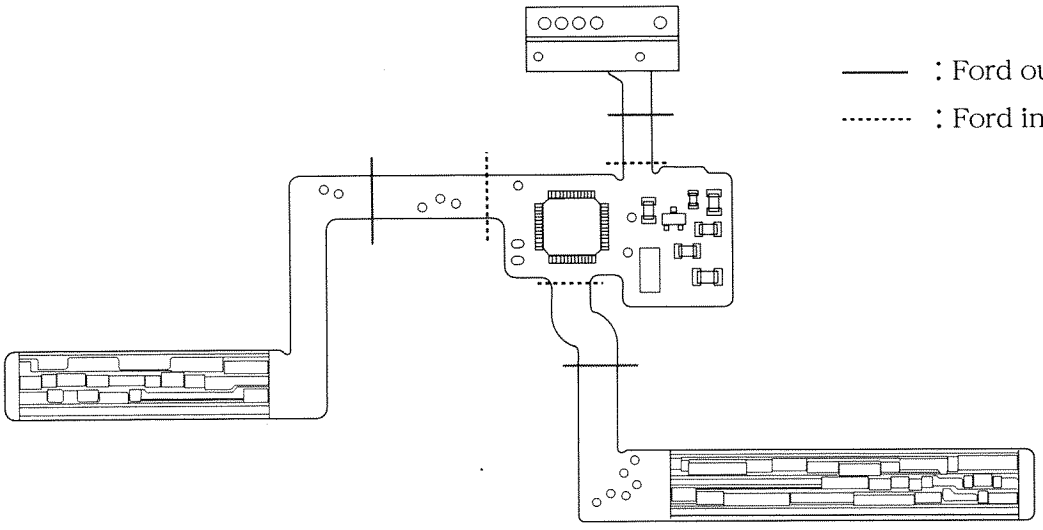
Note: In case the operation is kept on doing without removing the 4th lens group unit, make sure to mount the 3rd lens group unit now.

3. CAM GROOVE RING



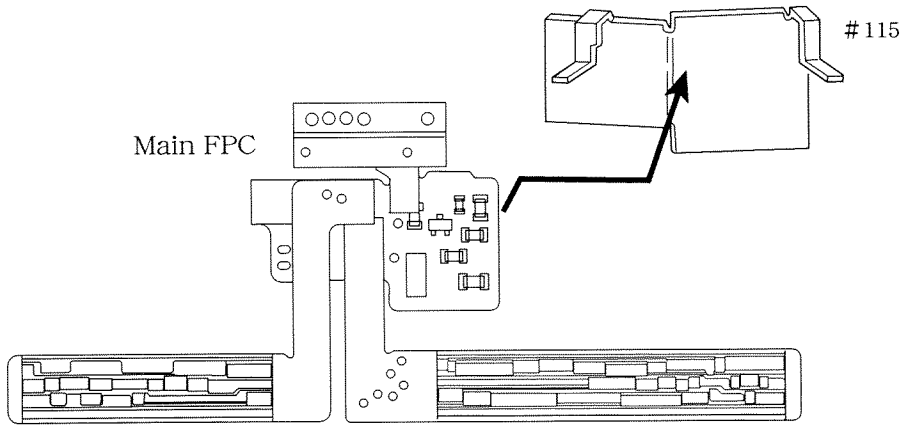
- Apply the grease CE-8 to the 6 cam grooves on the cam ring#82.

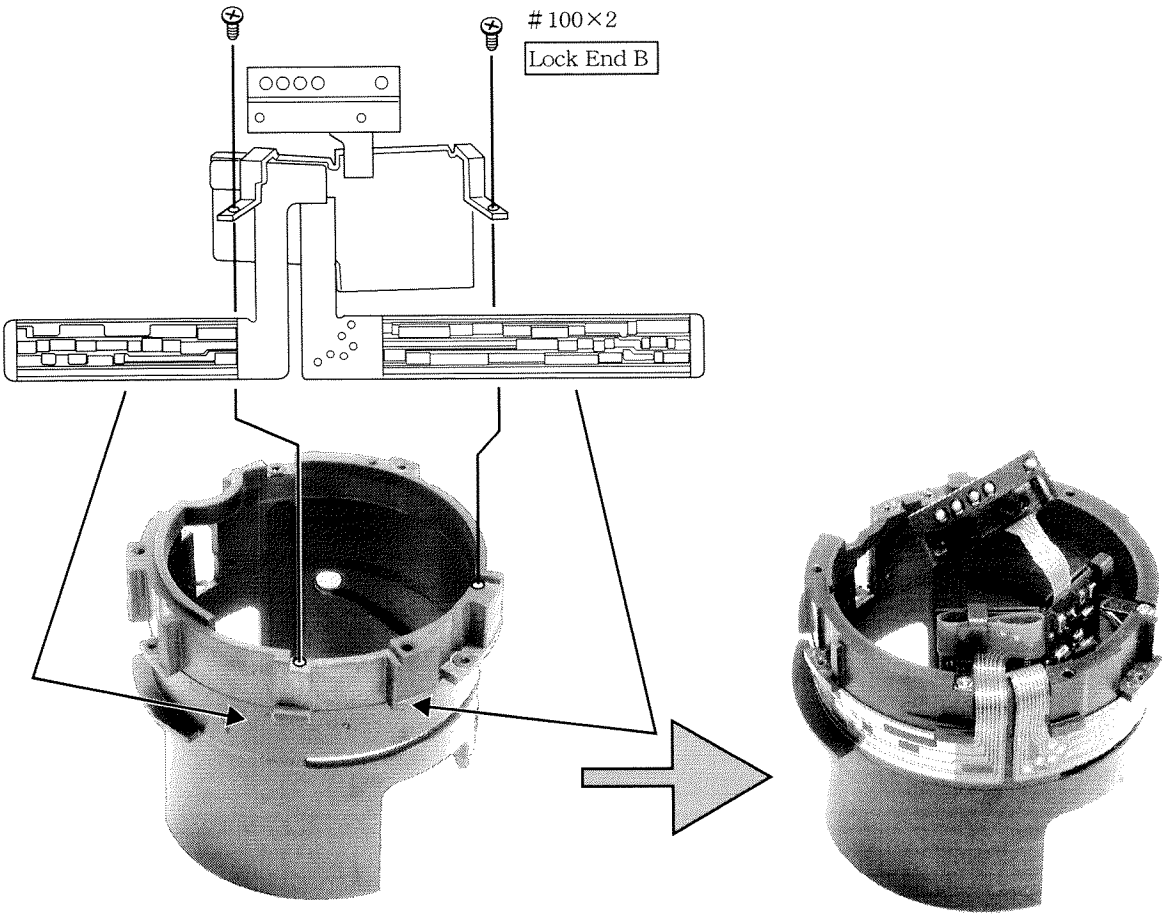
4. MAIN FPC



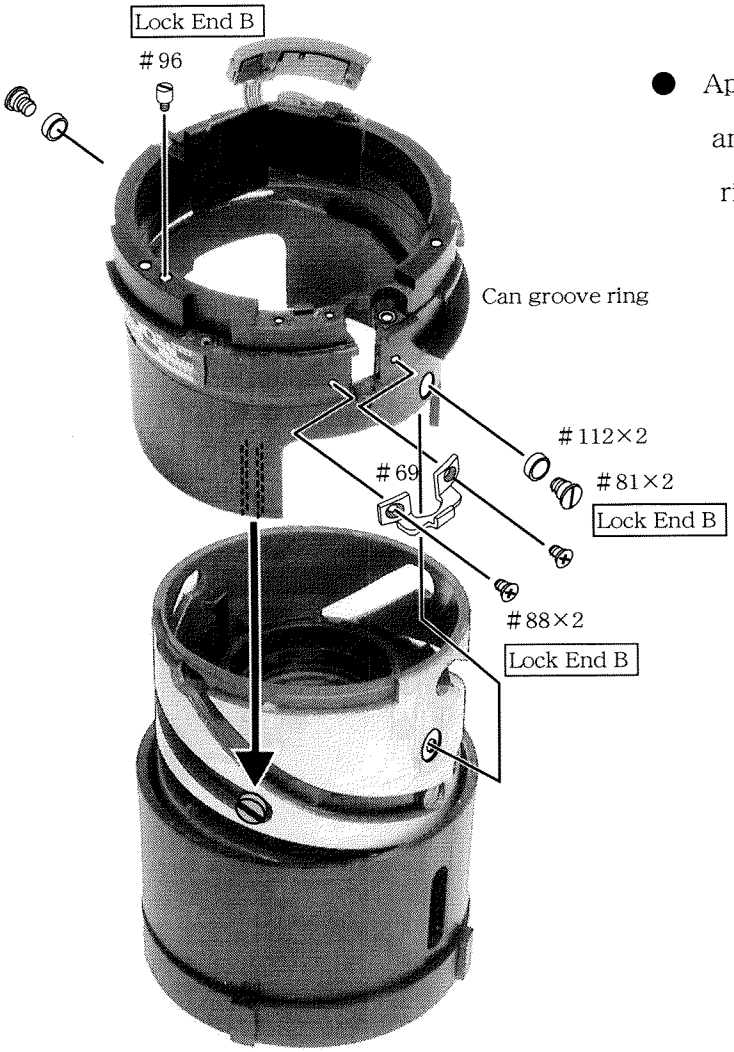
—— : Ford outside

····· : Ford inside

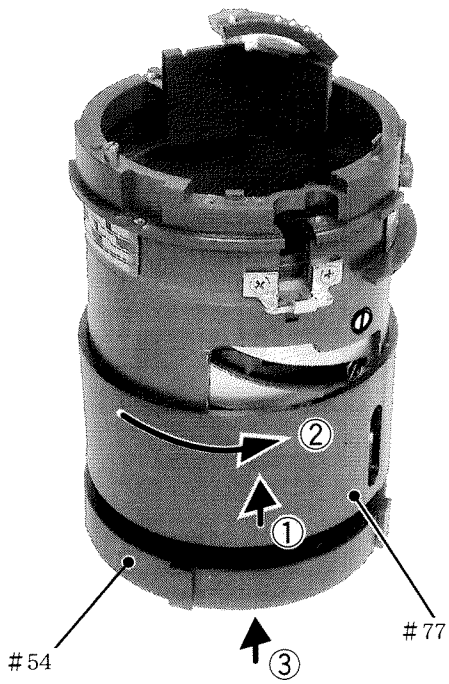

#115
Main FPC


#100×2
Lock End B

5. CAM GROOVE RING GROUP



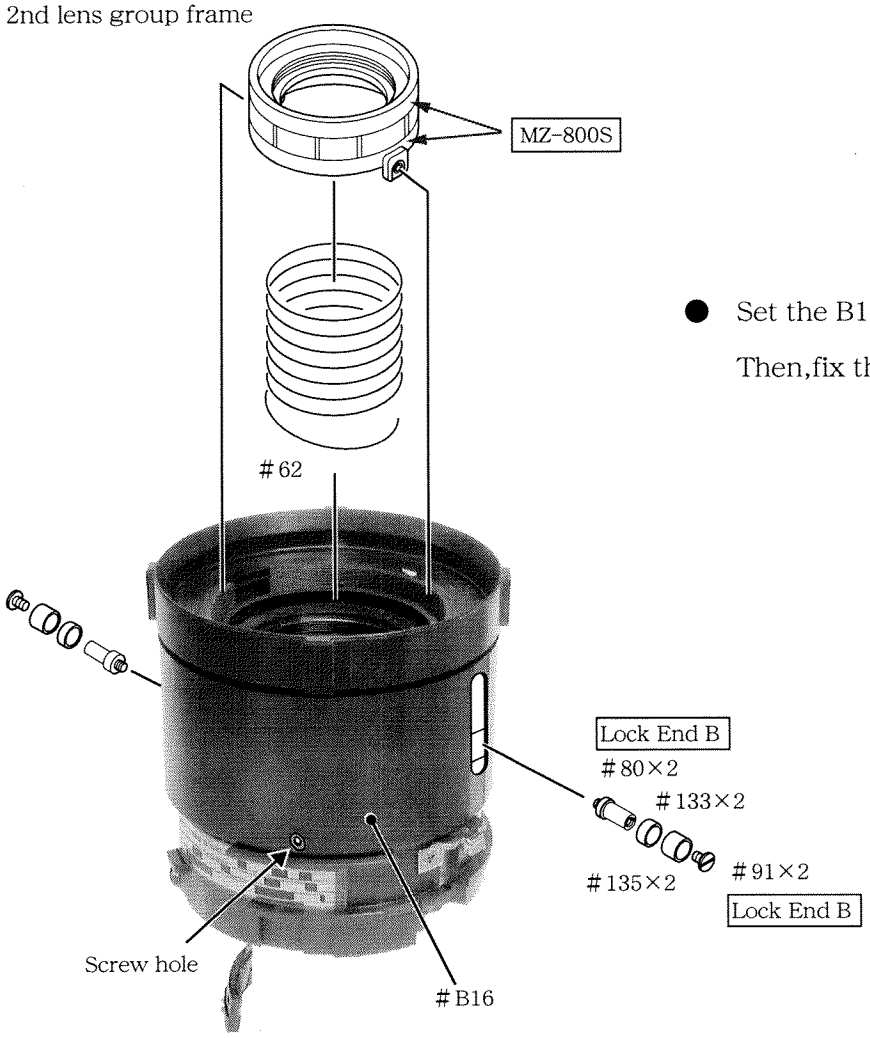
- Apply the grease MZ-800S to 2 cam grooves and to a straight groove inside the cam groove ring .



- Look for a position where the ring (#77) engages with the helicoid unit while pushing the ring (#77) in the arrow ① direction.
- Rotate the ring (#77) anticlockwise slightly.
- Push the fixed ring (#54) in the arrow③ direction.

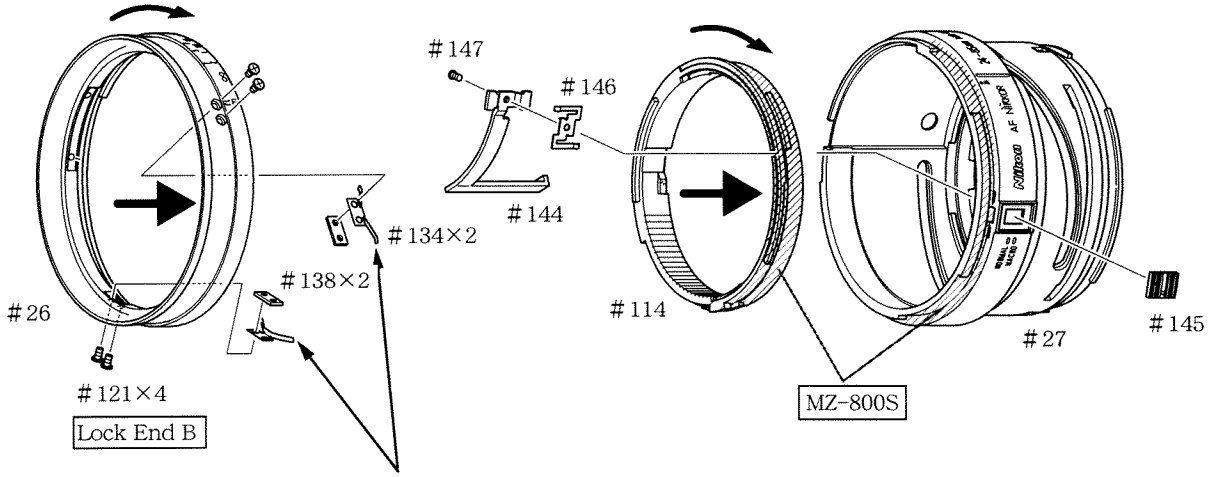
6. 2nd LENS GROUP FRAME

2nd lens group frame

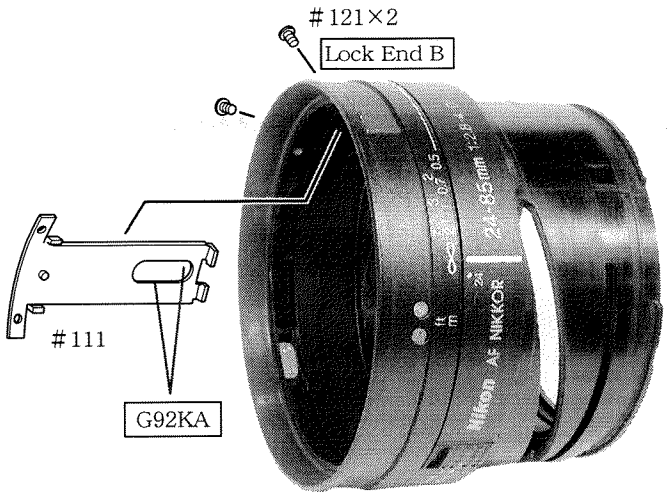


- Set the B16 as it is shown in the left figure. Then,fix the 2nd lens group freme to it.

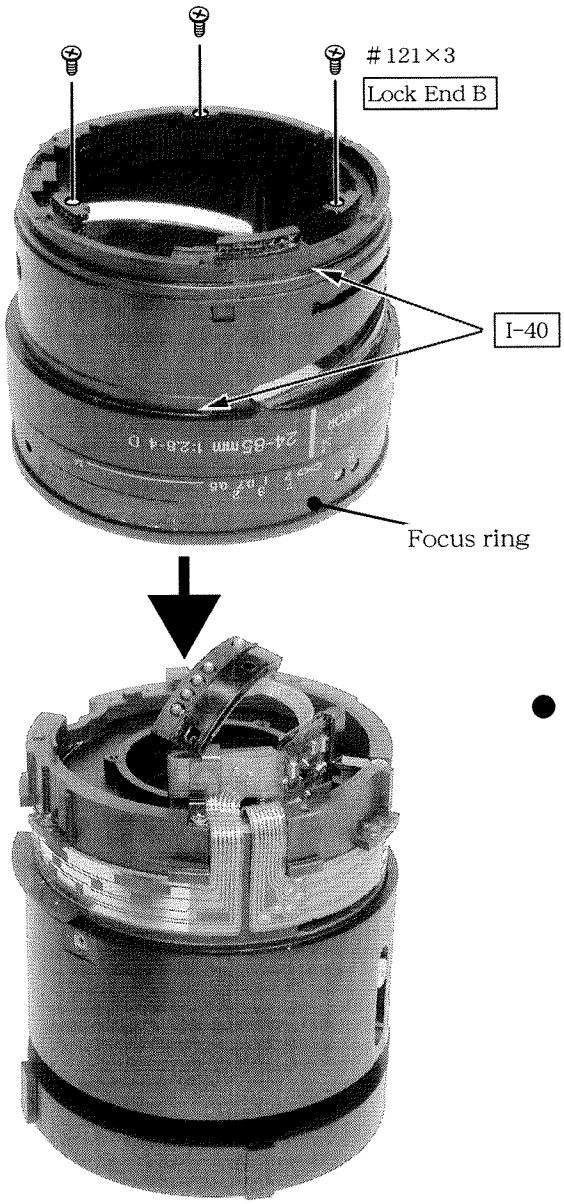
7. INDEX RING / FOCUS RINGE



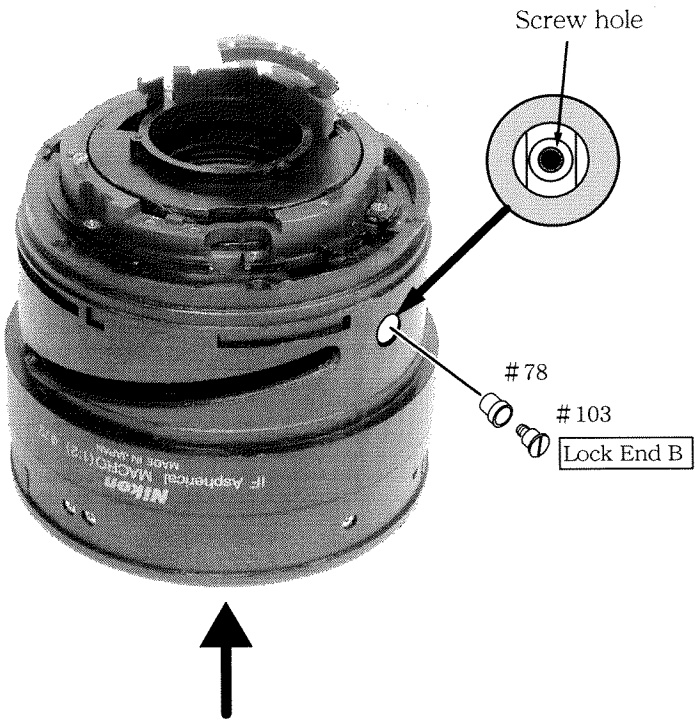
Notes: Rotate the focus ring not to bend the ends of springs (#134 x 2).



8. EXTERNAL PART



- Set the focus ring to infinity position to readily fix.

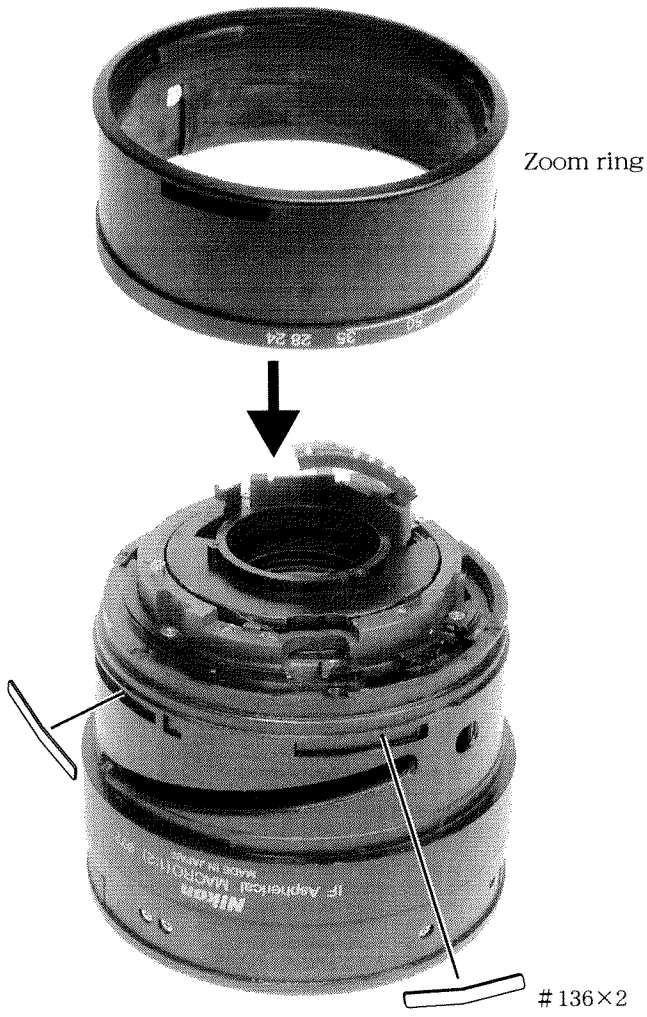


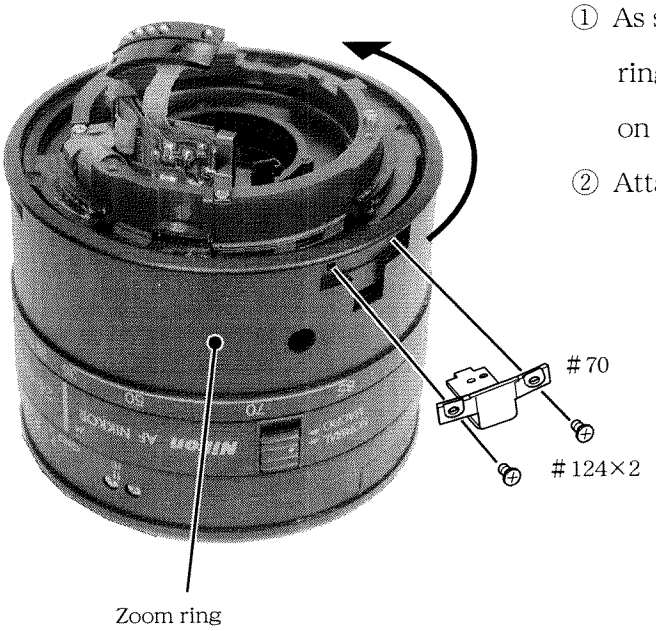
① As shoown in the left figure, set the focus ring top the touch the limit on the infinity side.

② Rotate the 2nd lens group frame and set it meet a screw hole as shown in the figure.

③ Fix the #78 and #103 to the 2nd lens group frame.

9. ZOOM RING / ZOOM KEY

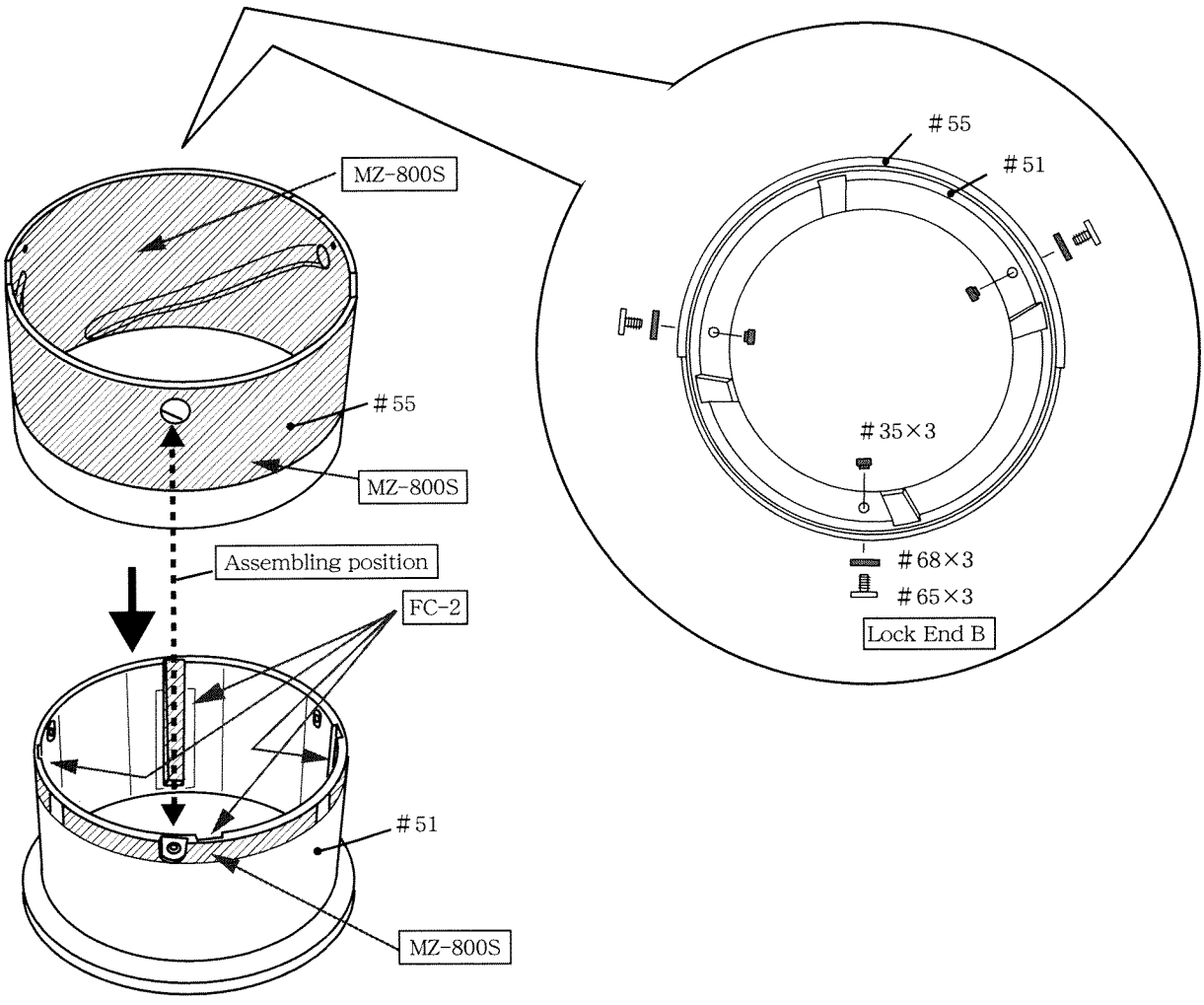


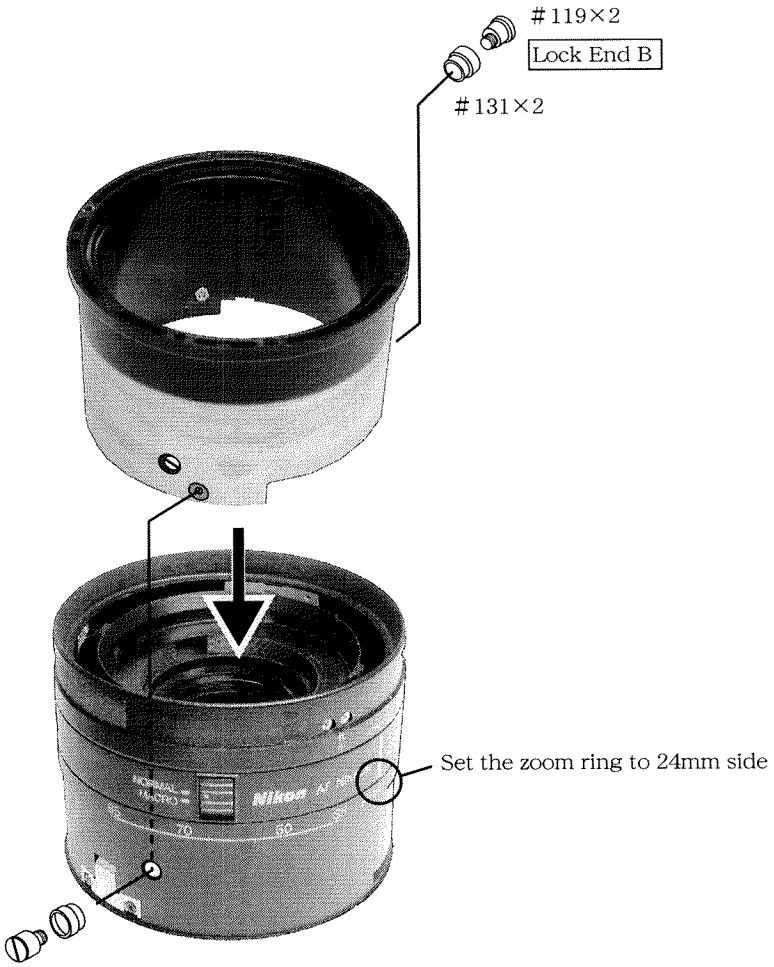


① As shoown in the left figure, rotate the zoom ring and then set its graduation to meet 24mm on the index.

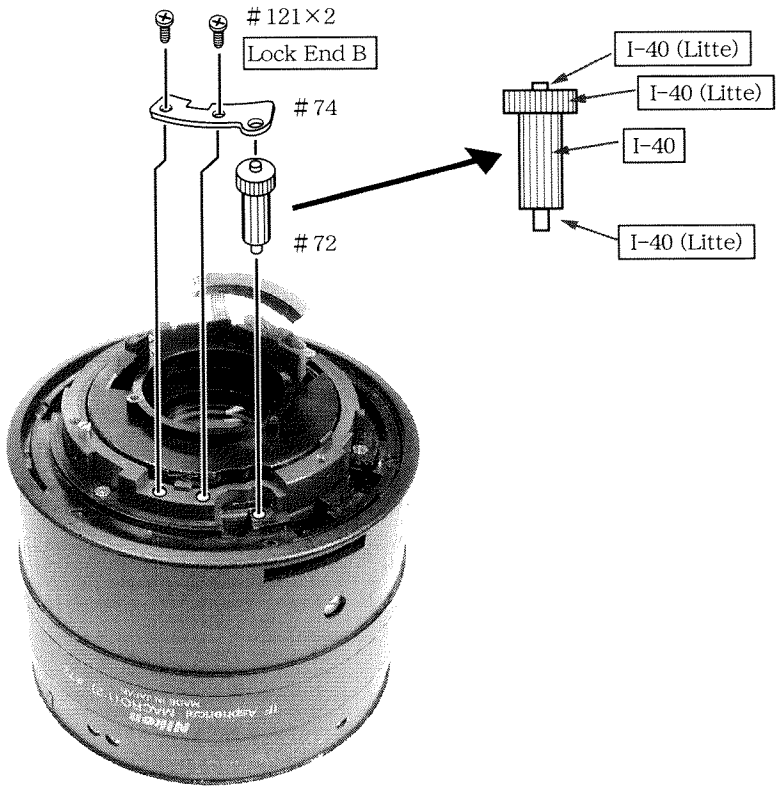
② Attach the zoom key #70.

10. CAM GROOVE RING GROUP

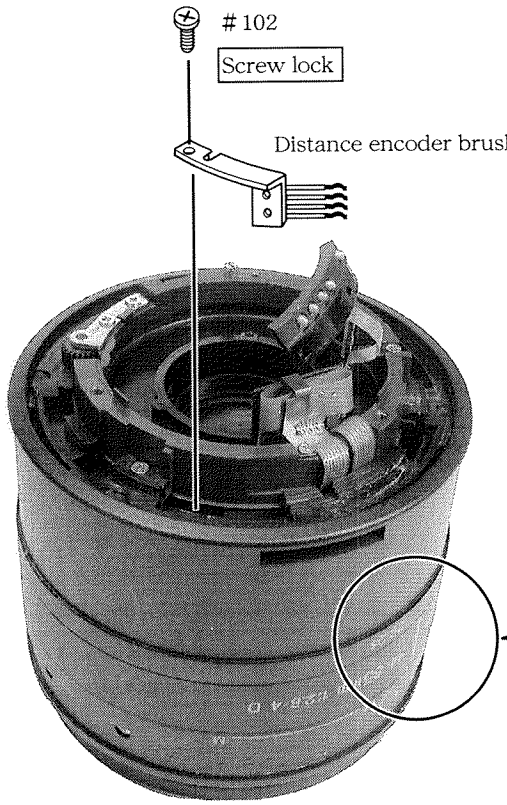



#119×2
Lock End B
#131×2
Set the zoom ring to 24mm side

11. A F GEAR


#121×2
Lock End B
#74
#72
I-40 (Litte)
I-40 (Litte)
I-40
I-40 (Litte)

12. DISTANCE ENCODER BRUSH

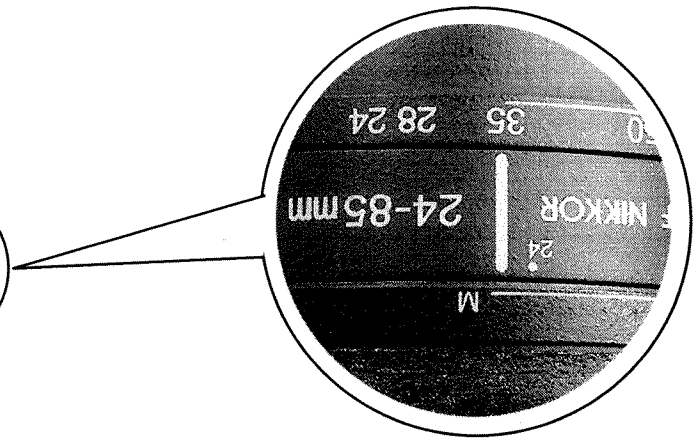


① Set the MACRO changeover switch to "MACRO".

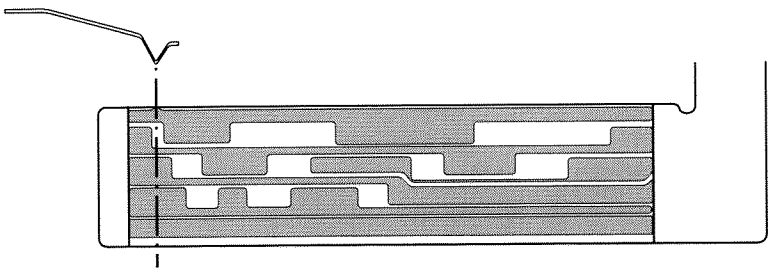
②Set the zoom ring and focus ring as shown in Figure below.

③ Attach the brush.

Then, tentatively fix the screw #102.



Set position of ZOOM RING and FOCUS RING



ADJUSTMENT OH THE DISTANCE ENCODER BRUSH POSITION

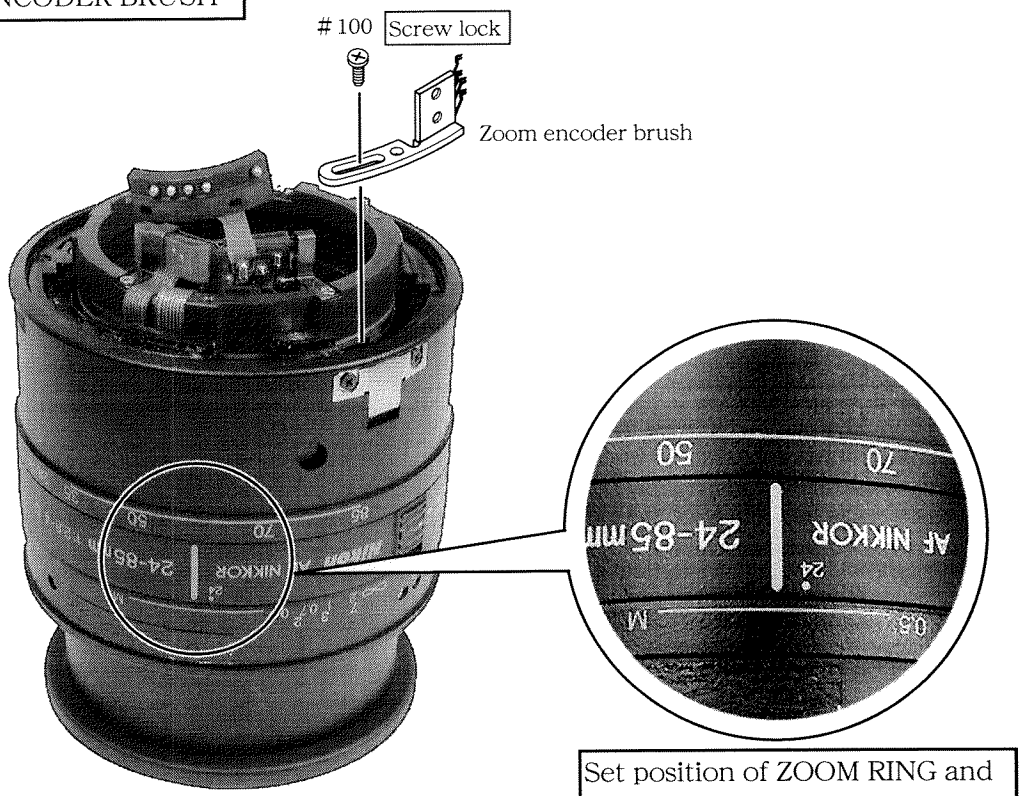
① Drive the focus ring unit it touches the limit on the infinity side.

② As shoown in the figure top, set the brush tip to contact the line.

③ Fix the screw #102 .

Also, drive the focus ring several times and then check where the brush is.

13. ZOOM ENCODER BRUSH



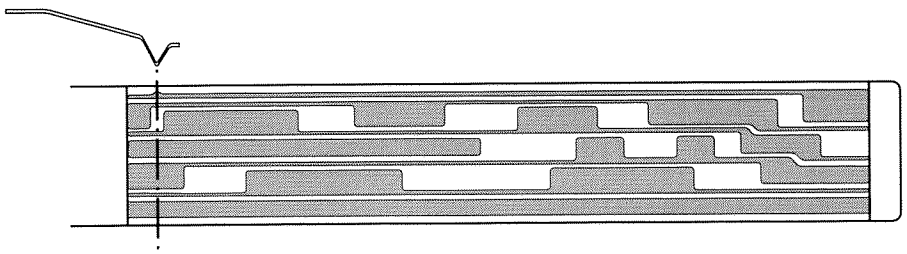
Set position of ZOOM RING and FOCUS RING

① Set the MACRO changeover switch to "MACRO".

② Set the zoom ring and focus ring as shown in Figure above.

③ Attach the brush.

Then, tentatively fix the screw #100.



ADJUSTMENT OH THE ZOOM ENCODER BRUSH POSITION

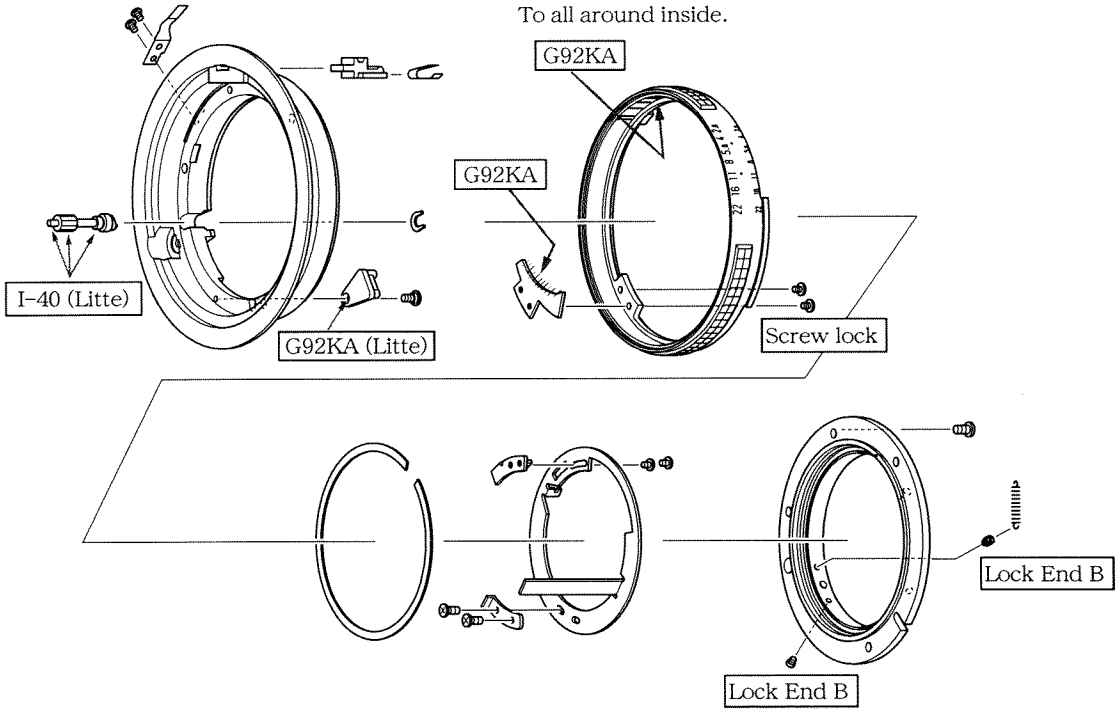
① Drive the zoom ring until it touches the limit on the TELE side.

② As shoown in the figure top, set the brush tip to contact the line.

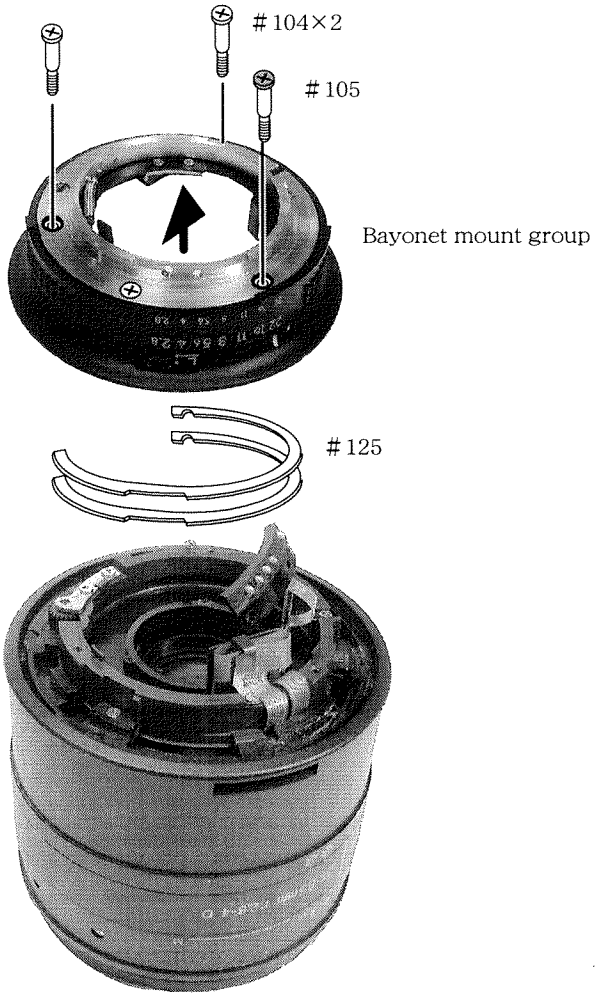
③ Fix the screw #100 .

Also, drive the focus ring several times and then check where the brush is.

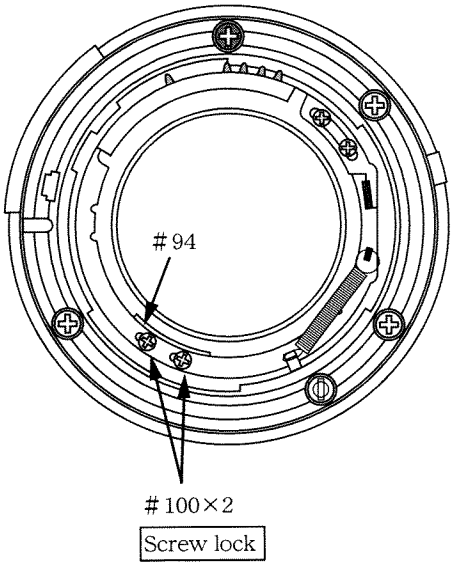
14. APERTURE RING / BAYONET MOUNT GROUP



15. BAYONET MOUNT GROUP



16. ADJUSTMENT OF APERTURE OPENING



① Unfasten screws #100×2 and move part #94 to adjust the aperture diameter.

Note: Make sure that the aperture diameter differs when the zoom ring is set to 24mm and to 85mm.

- Aperture diameter should be within the standard range when the aperture ring is rotated forward and backward.
- Aperture lever should be within the standard range when the aperture lever is snapped by your finger.

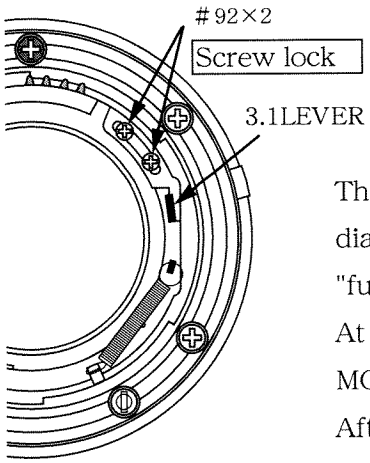
② After adjustment, secure screws #100×2 using Screw Lock.

STANDARD OF APERTURE OPENING

unit : mm

24mm			85mm		
Aperture setting	Inscribed circle diameter	Standard	Aperture setting	Inscribed circle diameter	Standard
2.8	(19.20)	17.76～20.77	4	(19.20)	18.36～22.00
4	(13.63)	11.95～15.05	5.6	(13.63)	11.70～16.55
5.6	(9.57)	7.91～11.18	8	(9.57)	8.18～11.57
8	(6.75)	5.56～7.86	11	(6.75)	5.42～8.61
11	(4.74)	3.69～5.85	16	(4.74)	3.81～6.04
16	(3.33)	2.61～4.14	22	(3.33)	2.69～4.27
22	(2.37)	1.85～2.94	(32)	(2.37)	1.91～3.03

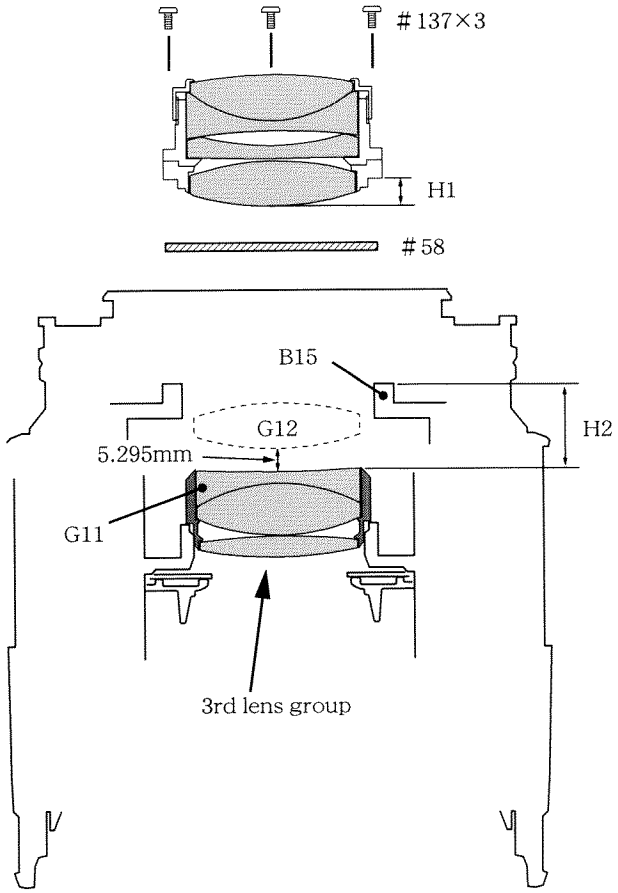
17. 3.1 LEVER position adjustment



The position of 3.1LEVER must be within $3.1^{+0.1}_{0}$ to obtain a good aperture diameter at
"full Aperture ". Loosen 2 SCREWs (#92) and make adjustment.
At the same time adjust the horizontal position not to contact with BAYONET MOUNT and LIGHT BAFFLE TUBE.
After adjustment, fix 2 SCREWs (#92) with the screw lock.

[Reference]
When adjusting DIAPHRAGM LEVER, set APERTURE RING to "f/2.8" and mount the tool (J18004-1) on BAYONET MOUNT.
When 3.1 LEVER is mounted with the groove on the tool as reference, the adjustment is easy.

18. HOW TO TAKE A GAP BETWEEN G11 AND G12 LENSES



① Mount the 3rd lens group unit on the lens barrel.

② Set the zoom ring to touch the limit on the WIDE side.
Then, set the lens on the flat table for the digital micrometer.

③ Measure the "H1" length shown in the left figure by with the digital micromete.

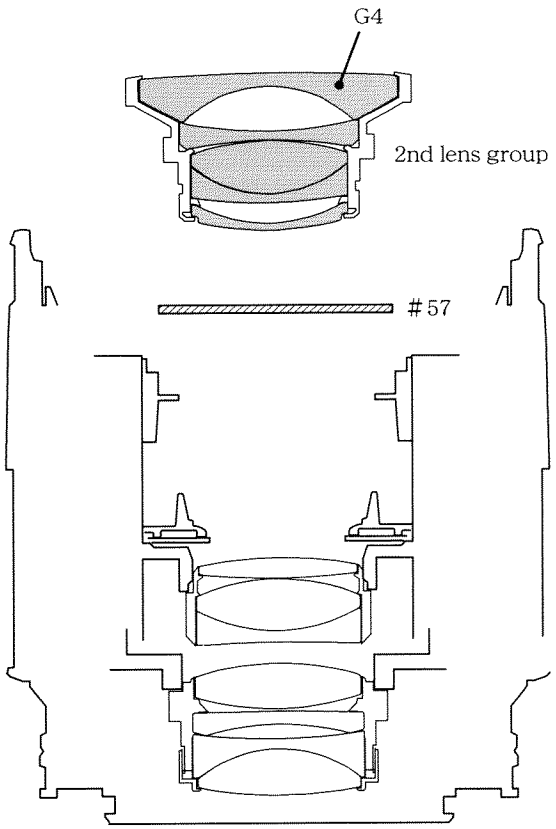
④ Measure the "H2" length shown in the left figure by with the digital micromete.

⑤ Calculate in accordance with the folloing formula in the size of mm.

5.295−(H1−H2)=The thickness of washer #58 drawn.

⑥ Mount the washer #58 and the 4th lens group.

19. 2nd LENS GROUP



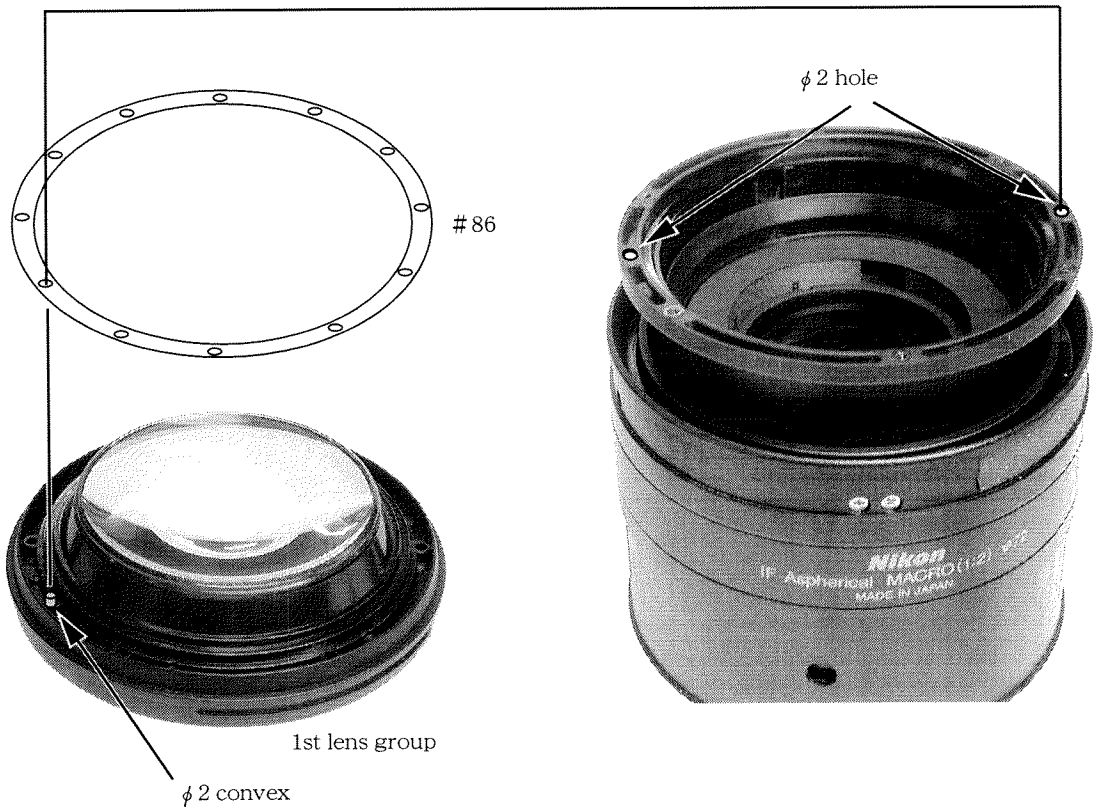
Note:The aspheric lens is employed on the G4 R1 side of 2nd lens group unit.

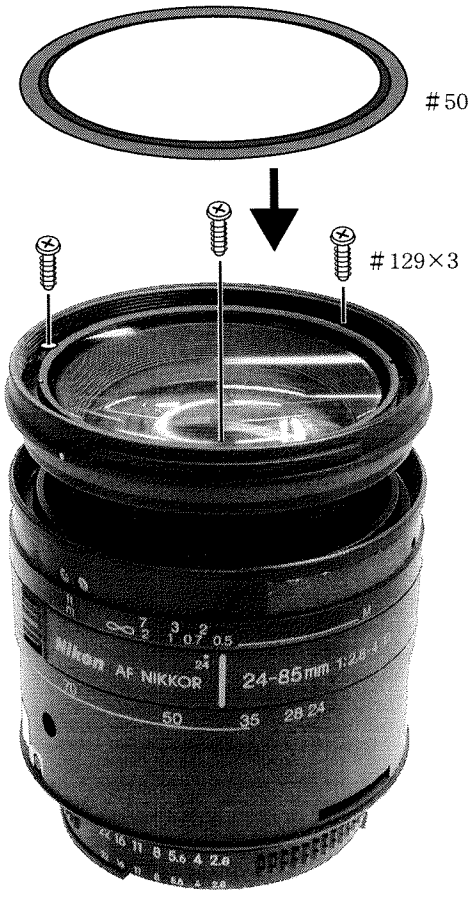
For cleaning on the surface of G4 lens, use the A-level dustcloth.

For your information, the technical information No.L(AF)-970060 shall be referable.

20. SHEET #67

21. 1st LENS GROUP



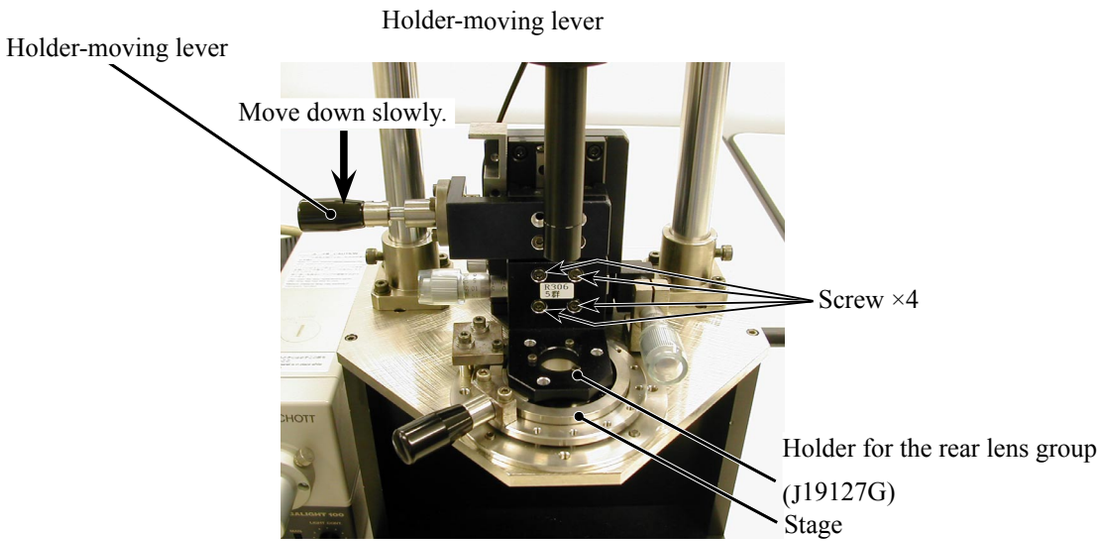


Lens Alignment

Note: This adjustment is required when the rear lens group (4th Lens chamber unit) is removed.

(1) Preparation of Lens optical alignment equipment

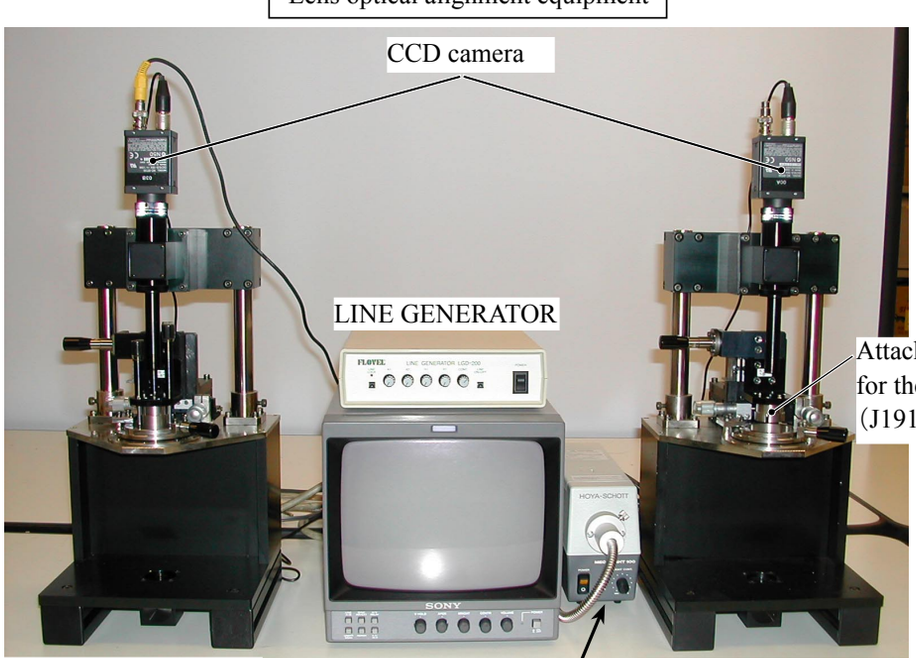
- Fix the attachment holder for the rear lens group (J19127G) in the lens equipment.
  How to fix: Move down the holder-moving lever slowly so that the holder touches the stage. Then tighten 4 screws to fix it.



- Create the center positioning tool (ref. Page A16-14 for how to create it).
- Create cardboards in which "Lens alignment chart" and "Viewers" are fit. (ref. Page A16-16 for how to create them.)

※ As for AF 24-85/2.8-4D, the below equipment(left) for center is NOT used.

Lens optical alignment equipment



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Back view of Lens optical alignment equipment

・ Connect each cable to the appropriate equipment with the same number. (e.g. Connect up ① to‘ ①)

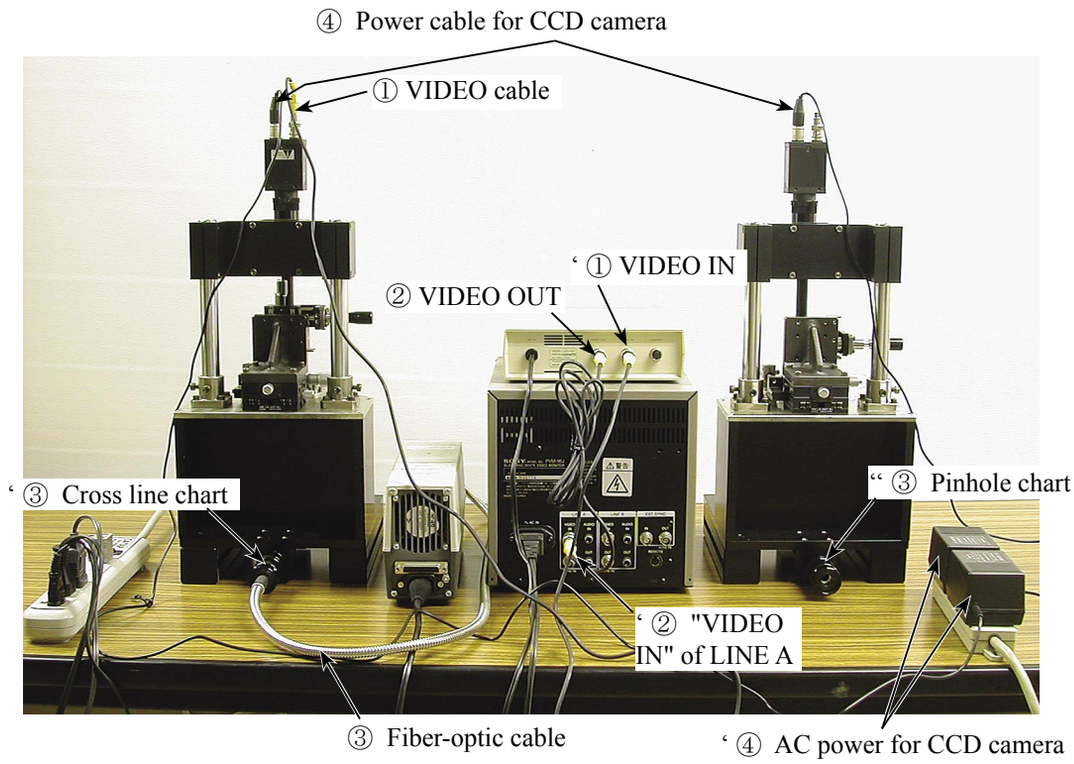
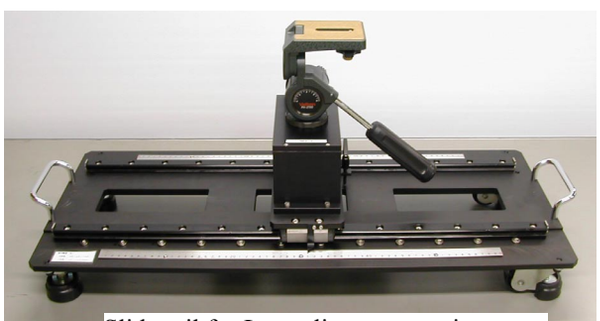
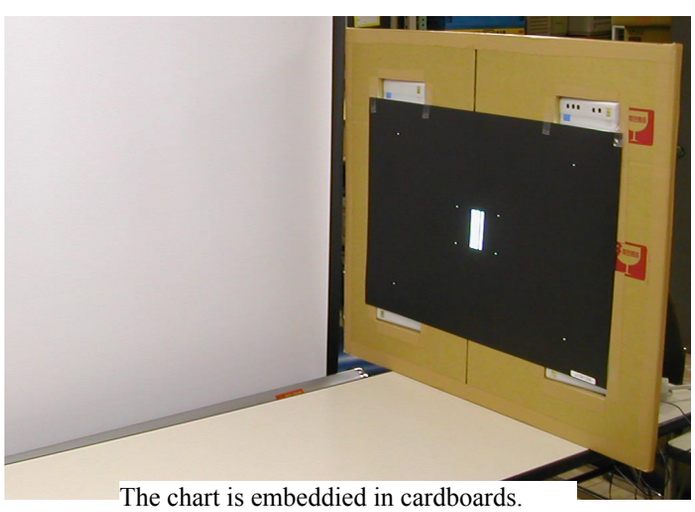

④ Power cable for CCD camera
① VIDEO cable
‘ ① VIDEO IN
② VIDEO OUT
‘ ③ Cross line chart
“ ③ Pinhole chart
‘ ② "VIDEO IN" of LINE A
③ Fiber-optic cable
‘ ④ AC power for CCD camera

Chart shooting equipment for alignment



Slide rail for Lens alignment equipment



The chart is embeddied in cardboards.

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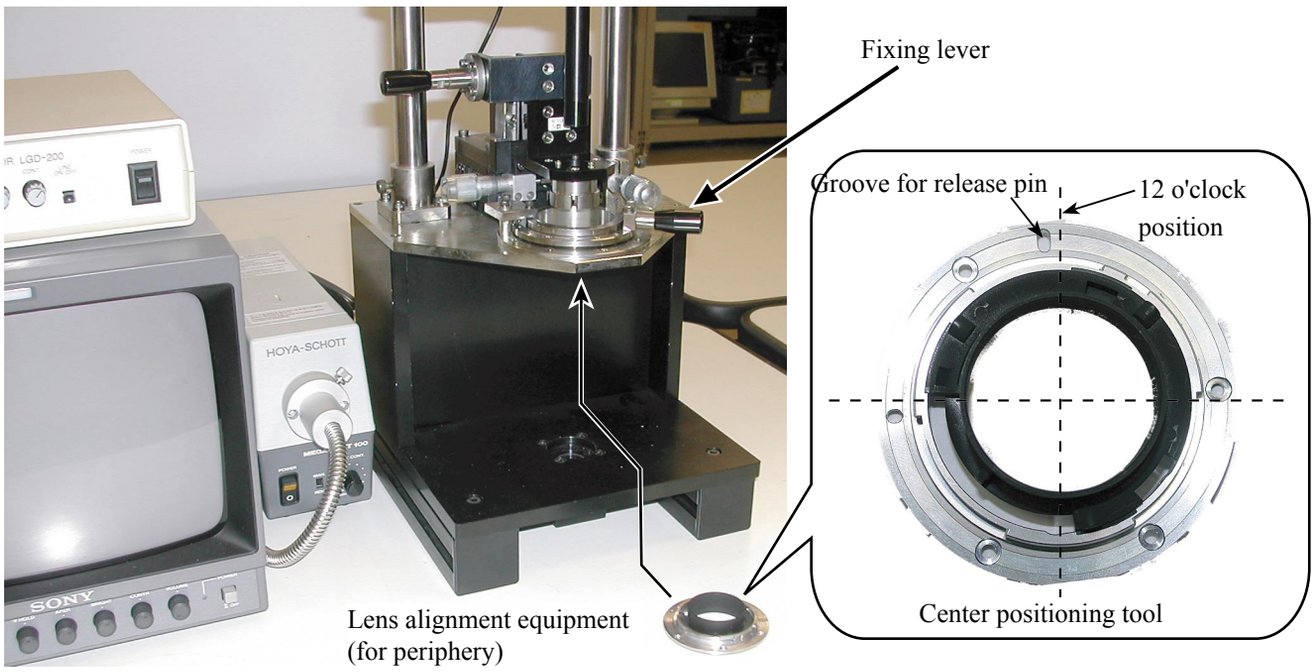
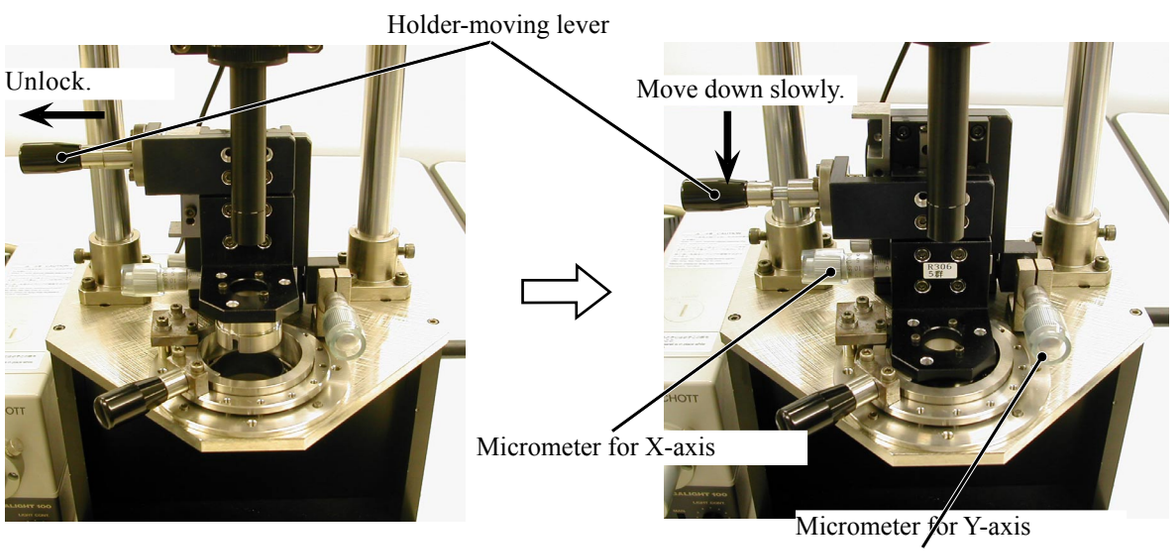
(2) Temporary positioning of Rear lens group

① Mount the (self-made) center positioning tool on the lens alignment equipment (for periphery) with the groove positioned slightly toward the counterclockwise direction from the below 12 o'clock position. Then turn the tool clockwise all the way to the right, and move the lever to the left to fix it.



② Unlock the holder-moving lever, and move the holder down slowly by the lever.



③ Adjust the holder's position by rotating the micrometers for X-axis or Y-axis so that the holder does not touch the protection ring of the center positioning tool.

Note) Without this alignment, the rear lens may be damaged by the holder.

④ Move the fixing lever of the alignment equipment to the right, and remove the center positioning tool from the equipment.

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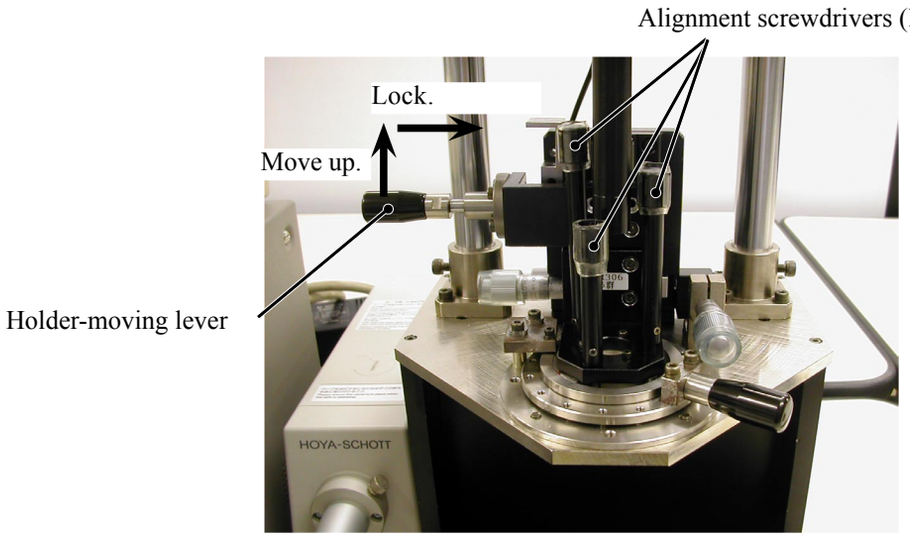
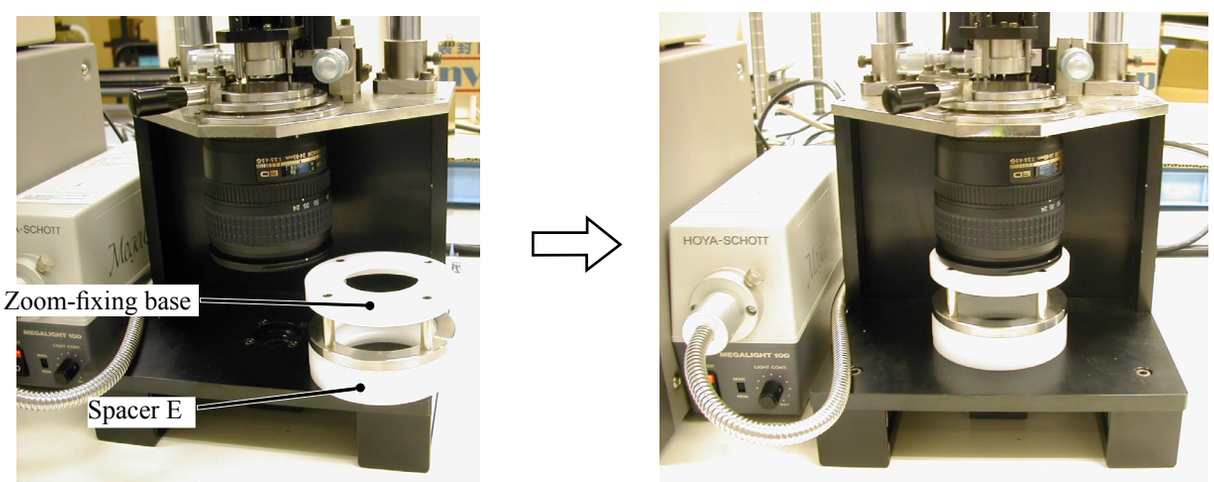
⑤ Insert the 3 alignment screwdrivers (long, middle, short) in the rear lens group holder, and move the holder-moving lever up to lock the holder.



⑥ With the 3 screws of the rear lens chamber of the lens being loose, mount the lens to be examined on the equipment (for periphery alignment). (ref. ① for how to attach it.)

⑦ Set the lens to WIDE-end. Place the zoom-fixing base, spacers (E) in position, then turn the zoom ring until the lens touches the zoom fixing base.



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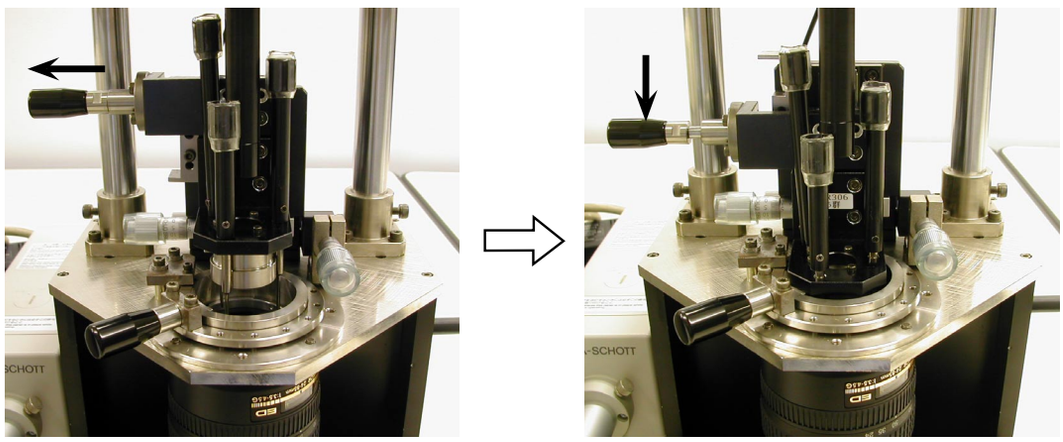
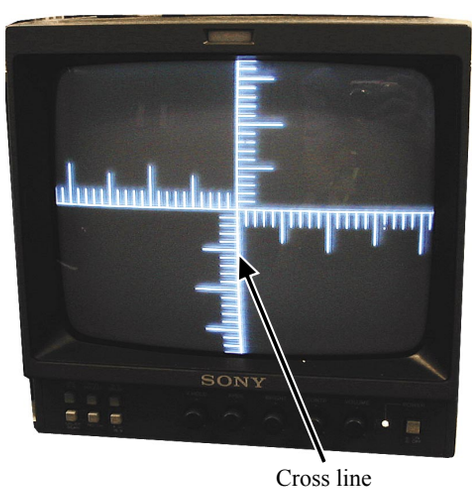
⑧ Unlock the holder-moving lever, and move the holder down slowly by the lever. Insert the 3 alignment screwdrivers (long, middle, short) in the loosened screw holes of the rear lens chamber.

Note) Because the screws cannot be seen, when inserting the alignment screwdrivers, put them straight down in the screw holes so that the screws can be easily found.

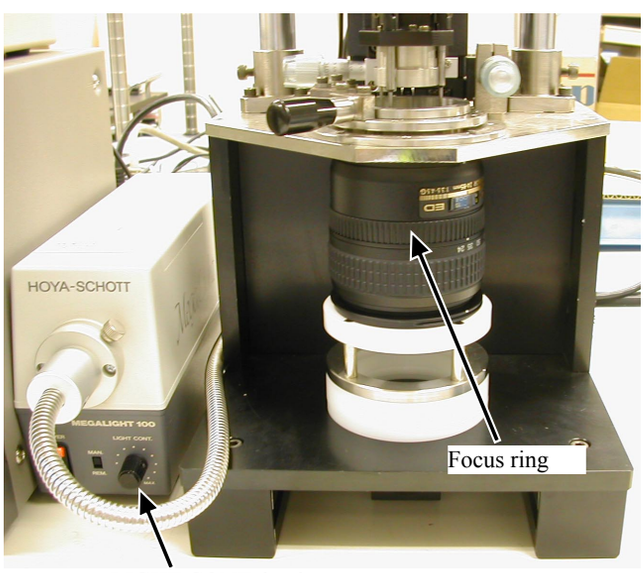


⑨ Turn the power of the Monitor, LINE GENERATOR, and MEGALIGHT 100 to ON. By checking the screen of the Monitor, rotate the micrometers (X and Y) so that the intersection point of the cross lines*1 (calibrated) comes in the center of the Monitor.

*1 Adjust the cross lines by turning the "LIGHT CONT." knob of "MEGALIGHT 100" and the focus ring until the calibration of the cross lines can be seen clearly.



Note) In case the cross lines are tilted, adjust them by turning the chart, which is screwed in the rear tube of the equipment.



⑩ When the intersection point of the cross lines comes in the center, tighten the 3 screws of the rear lens chamber with the alignment screwdrivers.

Note) When the holder is raised, the intersection point of the cross lines is misaligned. So make an adjustment by considering this.

⑪ Move the holder-moving lever up slowly to lock the holder, and remove the lens from the equipment (for periphery).

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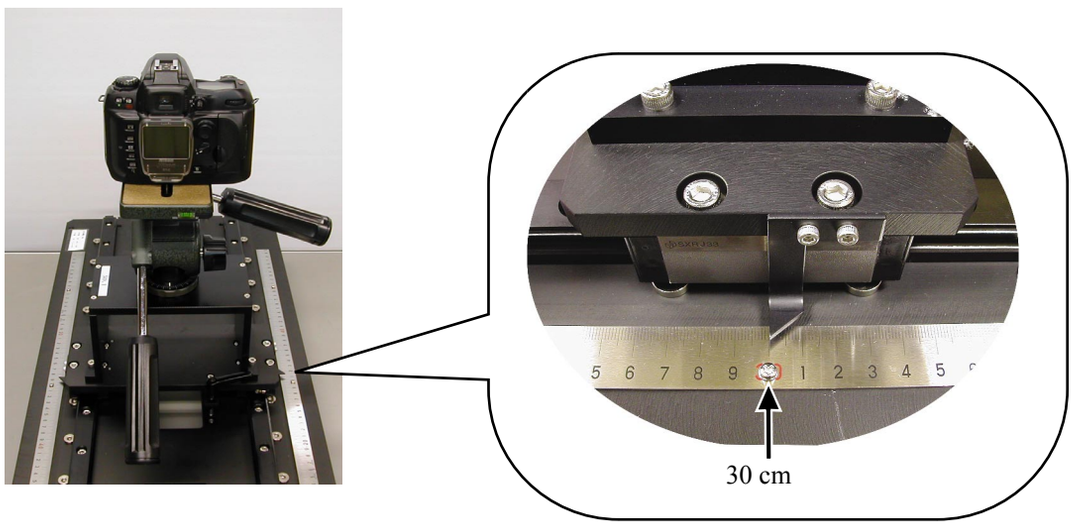
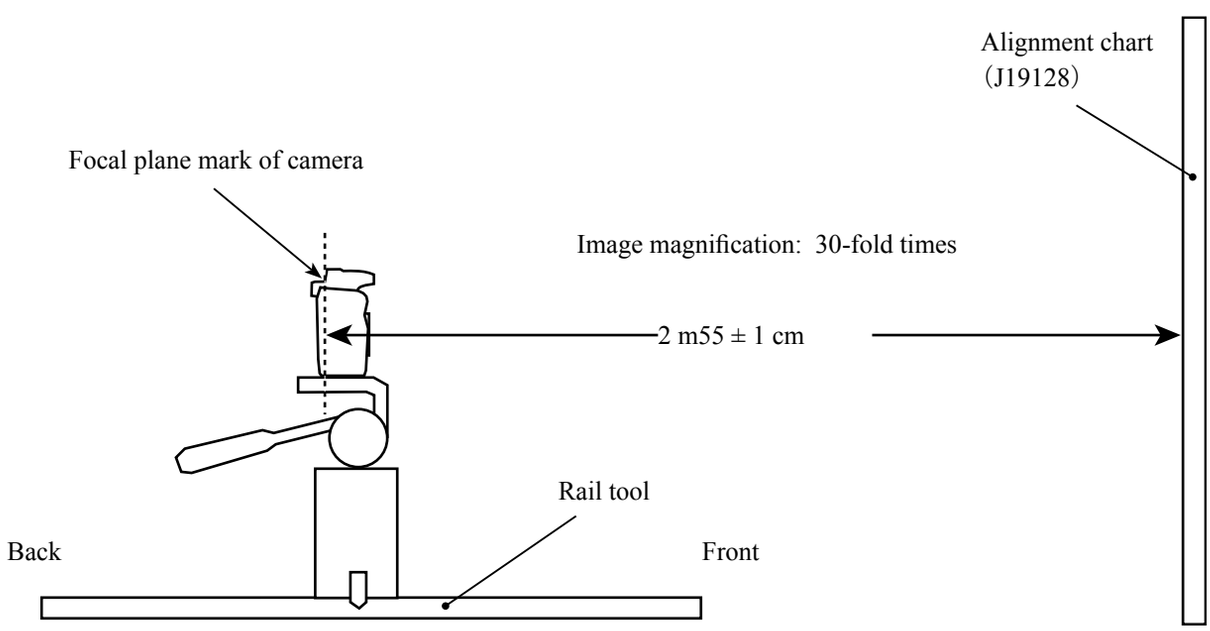
(3) Chart shooting for the rear lens group alignment

① Prepare a camera (D100). Set the shutter speed to “M1/80”and the focus mode to “S”. On the shooting menu, set “Image Quality” mode to “RAW”, “WB” to “Preset”and “ISO” to “200”.

② Set up the camera (D100) on a tripod on the slide rail. Set the indication pointer of the tripod to 30 cm.



③ Set the alignment chart (J19128) as shown below.



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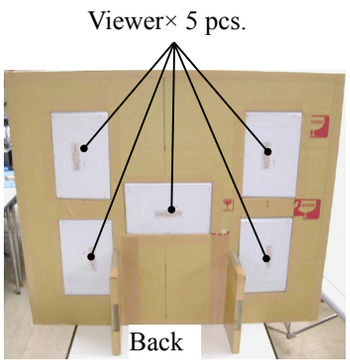
④ Turn the power of viewers (5 pcs.) to ON.

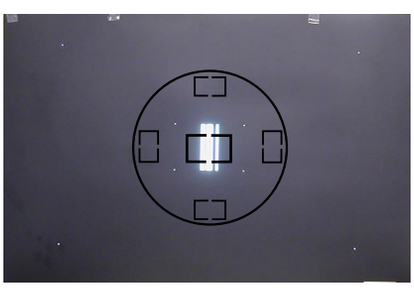
(Note: If the batteries of viewers are exhausted with decreased brightness, the shooting data cannot be obtained correctly.)



⑤ Fit the lens to be examined in the camera (D100). Set the zoom to TELE (85 mm).

⑥ By looking through the viewfinder, adjust the height and tilt to make the chart fill the entire finder field frame.

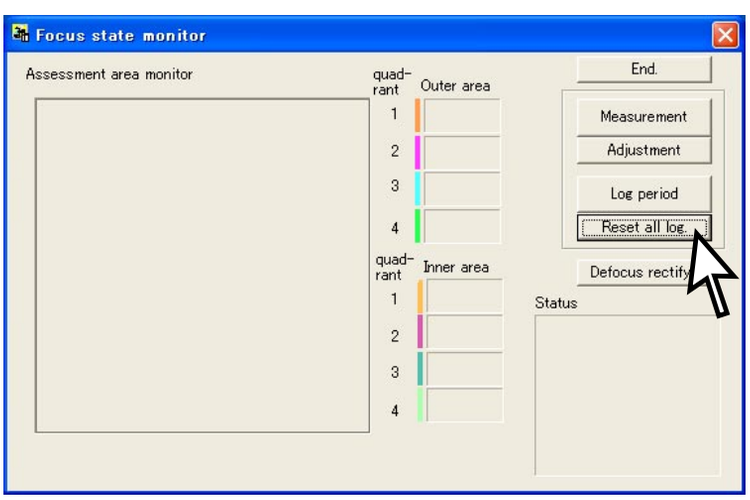
⑦ Adjust the tilt of the slide rail to make the 3 chart lines position in the center of the viewfinder, when the tripod is slid all the way to the front and back.



⑧ Connect the PC and camera via USB cable. (Camera setting: Mass Storage)

⑨ Start the adjustment software (LWM.exe).

⑩ “Click the "Reset all log" button.



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⑫ Set the indication pointer of the tripod to 30 cm.

"Focusing" △ (Revision)

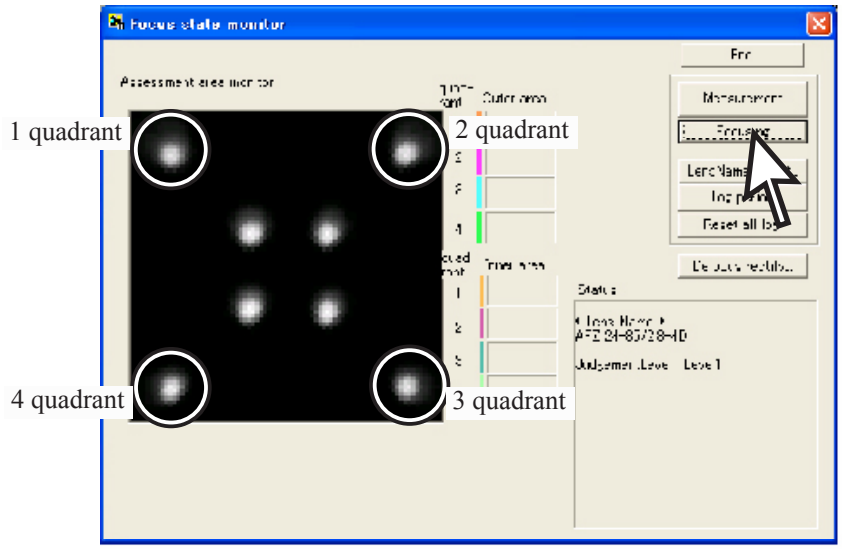
⑬ Click the "~~adjustment~~" button to activate the AF and the shutter will be released.

⑭ Check that the shape of shot 8 point images (as shown below) becomes as perfect as circle.

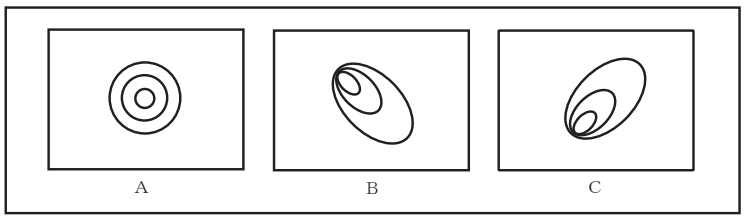
※ In case the point images are ellipsoid, perform from ① to ⑦ of "(4) Rear lens group alignment" to make a temporary adjustment by moving the point at the intersection of the crossed lines so that the images become as perfect as circle. Then start from ⑪ to make a readjustment.

~~Refer to the below for the moving direction of the rear lens group.~~

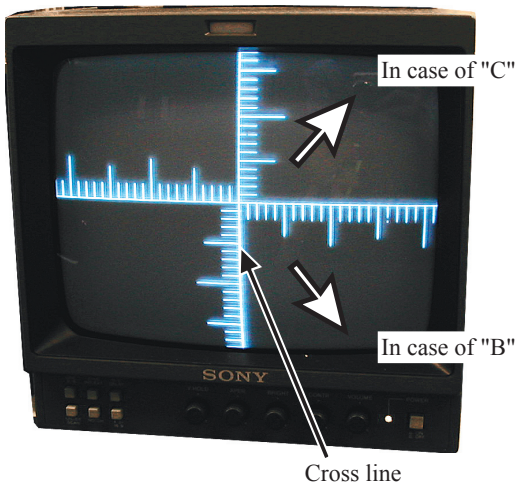
The direction of the movement of the rear lens group for adjustment: If point image of 1-3 quadrants is like "B", move the intersection point towards lower right direction. If point image of 2-4 quadrants is like "C", move the interseciton point towards upper right direction. △ (Revision)



Point image



Moving direction of intersecting point



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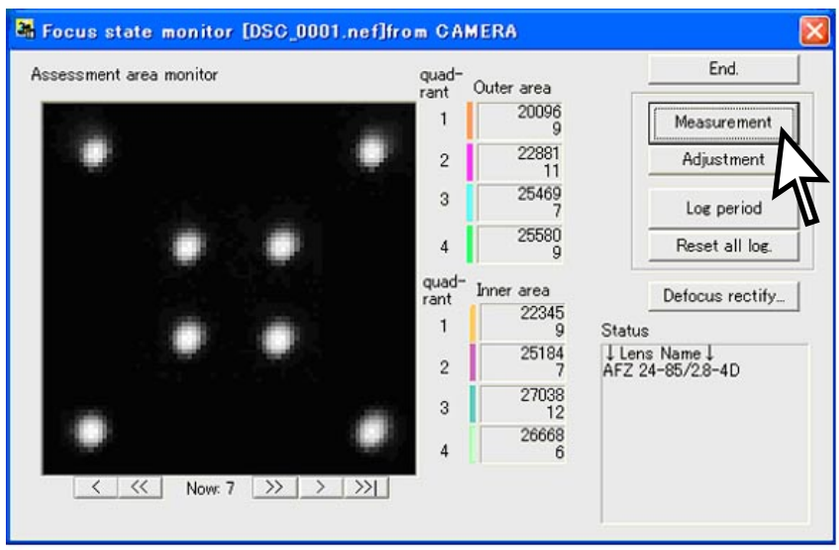
⑭ Set the focus mode of the camera (D100) to "M".

⑮ Slide the tripod to the front by 18 ± 0.1 cm.

⑯ Click the "measurement" button of the adjustment software.

⑰ When the shutter of the camera is released, slide the tripod to the back by 6 ± 0.1 cm and make a remeasurement.

⑱ Again, slide the tripod to the back by 6 ± 0.1 cm and make a remeasurement.
Repeat this operation 4 more times, totalling in 7 measurements. (The total sliding distance is 36 cm.)



Note 1: When the below warning is given, there may be some defects in the brightness of the viewers and/or parallelism of the chart and camera, etc. So correct the above and make a remeasurement.

Note 2: When the below warning is given, recheck that the Quality mode of the camera is set to RAW.

Note 3: When the below warning is given, recheck that the zoom ring of the lens is set to TELE-end.

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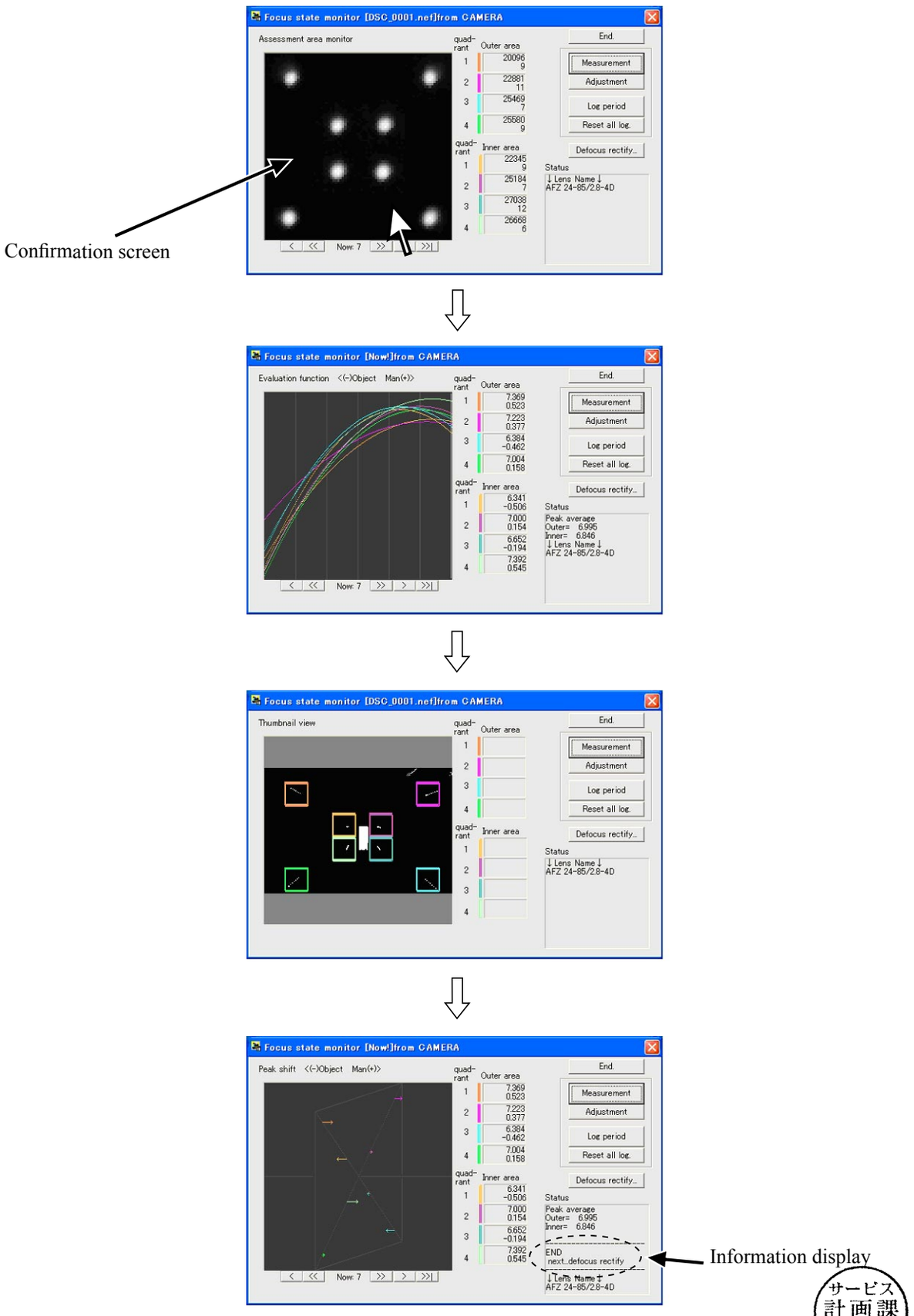
⑲ After the 7 measurements, point the cursor to the confirmation screen of the software. Click it 3 times, and if "END" is displayed on the Information, the lens optical alignment is completed.

If "END" is NOT displayed, go to the next “(4) Rear lens group alignment” to readjust.

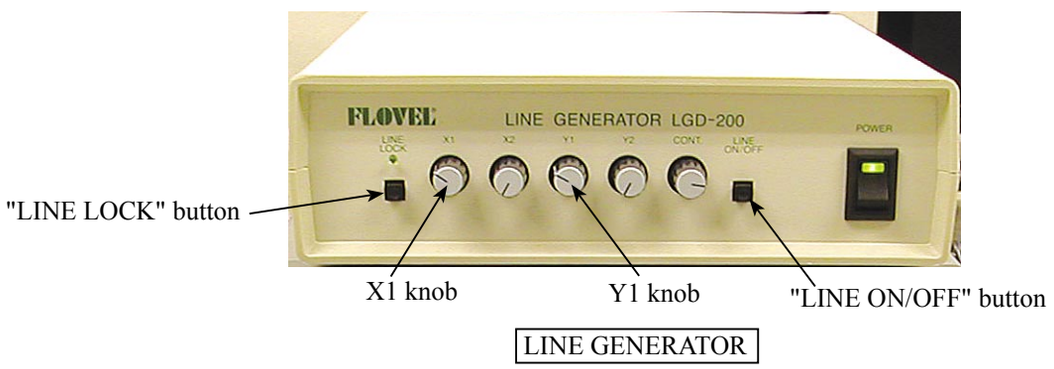


(4) Rear lens group alignment

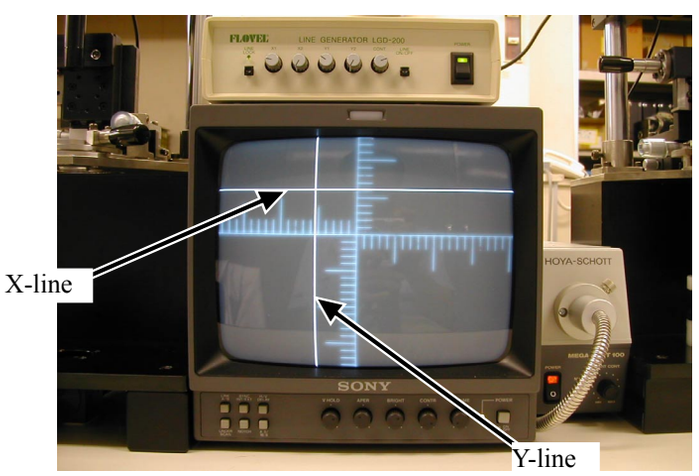
① Mount the lens in the equipment (for center). (ref. ① of (2) for how to fit in it.)

② Turn the power of the monitor, LINE GENERATOR, and MEGALIGHT100 to ON.

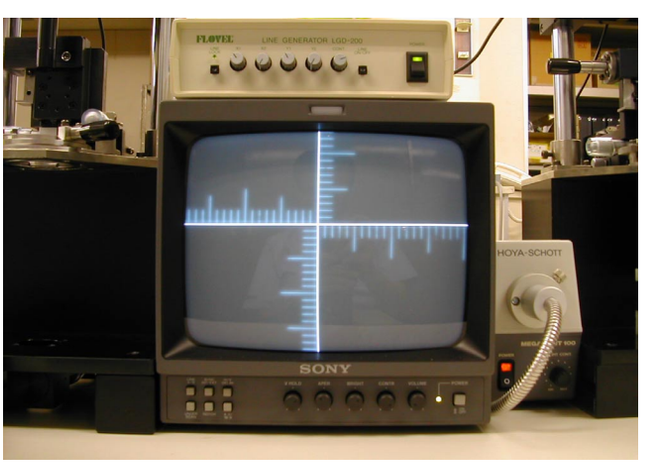
③ Press the "LINE ON/OFF" button of LINE GENERATOR. Turn the knobs of “X1” and “Y1” so that X- and Y-lines are displayed on the monitor.
Superpose these X- and Y-lines on the cross lines of the CCD camera. Then press "LINE LOCK" button to fix these X- and Y-lines.



LINE GENERATOR



⇩



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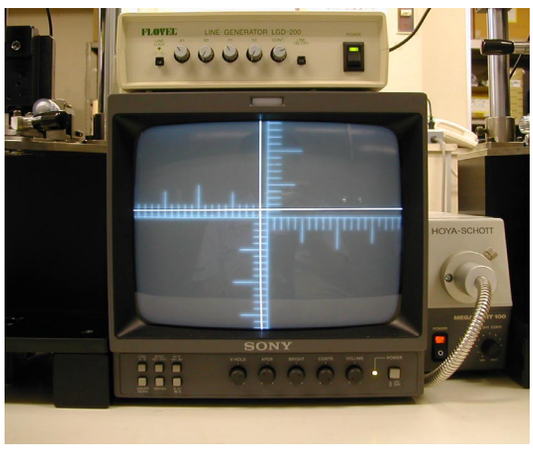
④ Unlock the holder-moving lever, and move the holder down slowly by the lever.

⑤ Insert the alignment screwdrivers (long, middle, short) into the screw holes of the 5th lens chamber, and loosen the 3 screws.

⑥ Rotate the micrometers (X and Y), and shift the cross lines by the scales that were results of the chart shooting of the 5th lens group alignment.
(e.g. Refer to "Pic.2" for the case of <X directions:+1, Y directions:-1>)



Pic.2

⑦ Fix the 3 screws of the 5th lens chamber with the alignment screwdrivers. Move the holder-moving lever up to lock the holder.

⑧ Check that a shift length caused by the cross lines and the X/Y lines is equal to the scales (1 = 1 scale of the calibrated cross lines) of the results of "Chart shooting of the rear lens group alignment". (ref. Pic.2)
Note: After fixing the 3 screws of the rear lens chamber, if a shift length is different from the results of the chart shooting, repeat the procedure from ④ to ⑧ until they become equal.

⑨ Turn each power of the monitor, LINE GENERATOR, and MEGALIGHT 100 to OFF. Remove the lens from the equipment (for periphery).
Then go back to “(3) Chart shooting of the rear lens group alignment” and repeat the procedure (3) and (4) until the result becomes "END".

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How to create positioning tool of rear-lens-group holder for lens alignment

1: Summary

1-1: This is a positioning tool of the rear lens group holder for lens alignment, in order to secure the position for attaching the rear lens group temporarily.

2: Preparation

2-1: The following is used:

* Rear cover ring (JAA78071- Part no. :1K631-287) X 1 pc.
* Bayonet mount (JAA78071- Part no.: 1K404-157) X 1 pc.
* Mount rotation stopper screw (JAA78071- Part no.: 1K120-012) X 1 pc.

3. Procedure

3-1: Put the bayonet mount as shown in Fig. 1.

Fig. 1

3-2: Mount the reversed rear cover ring on the position of Fig. 1, and attach them as shown in Fig. 2.

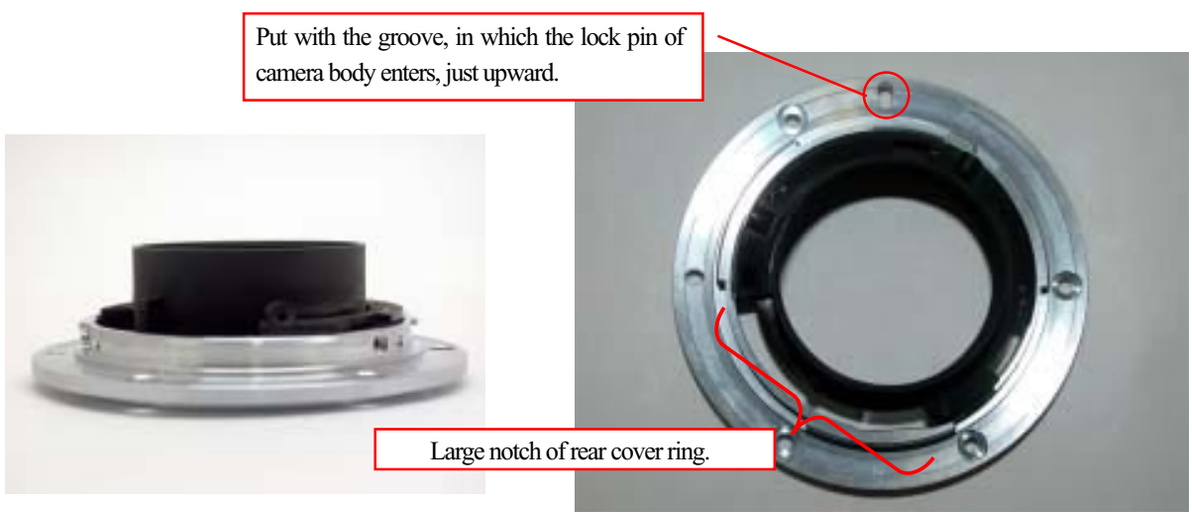

Fig. 2

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3-3: Turn the rear cover ring clockwise, which was attached to the bayonet mount. Then stop at the position as shown in Fig.3-1.

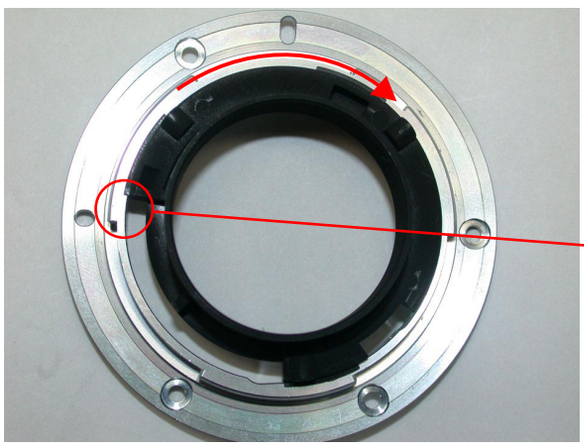


Fig. 3

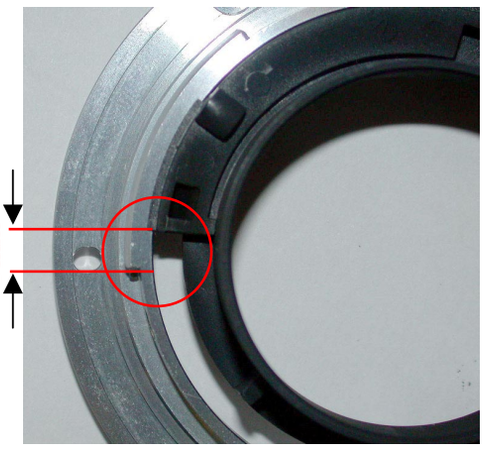


Fig. 3-1

3-4: Fix the following 3 locations of the rear cover ring with the instant adhesive.

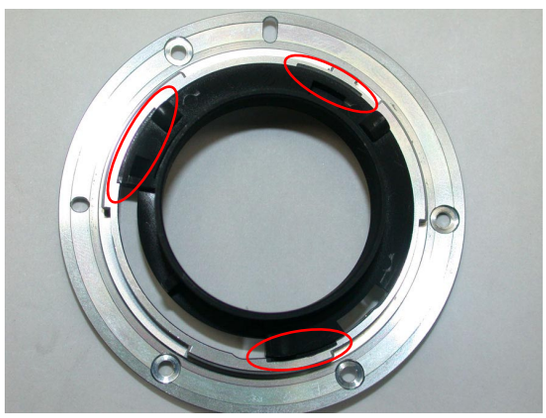
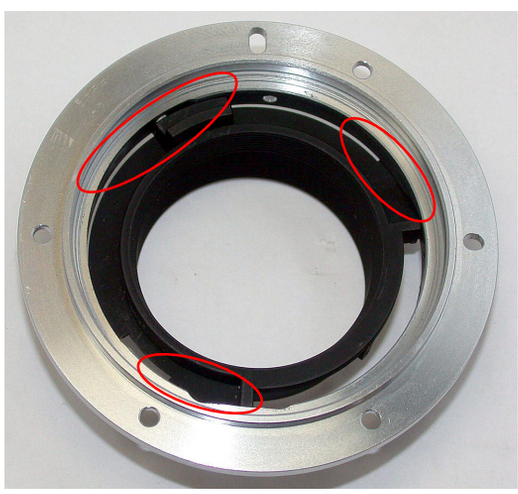


Fig. 4

3-5: Turn the bayonet mount over. Reinforce the following 3 locations with the adhesive to attach the bayonet mount and rear cover ring firmly.



3-6: Attach the mount rotation stopper screw at the appropriate position.

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How to create Setting board of "Lens alignment chart" and "Viewer"

1. Summary

1-1: In order to get necessary data for lens alignment, this board is created to use for setting a special chart and light viewers (for chart illumination), while taking pictures of the special chart with a digital camera.

2. Preparation

2-1: Prepare a board (760 x 880 x 20 mm) or 2 package cardboard boxes (size 2.33).
(Note) Because you have to cut out the shape to embed light viewers, choose package cardboard boxes (size 2.33) or material which can be easily cut. — ref. Fig. 1

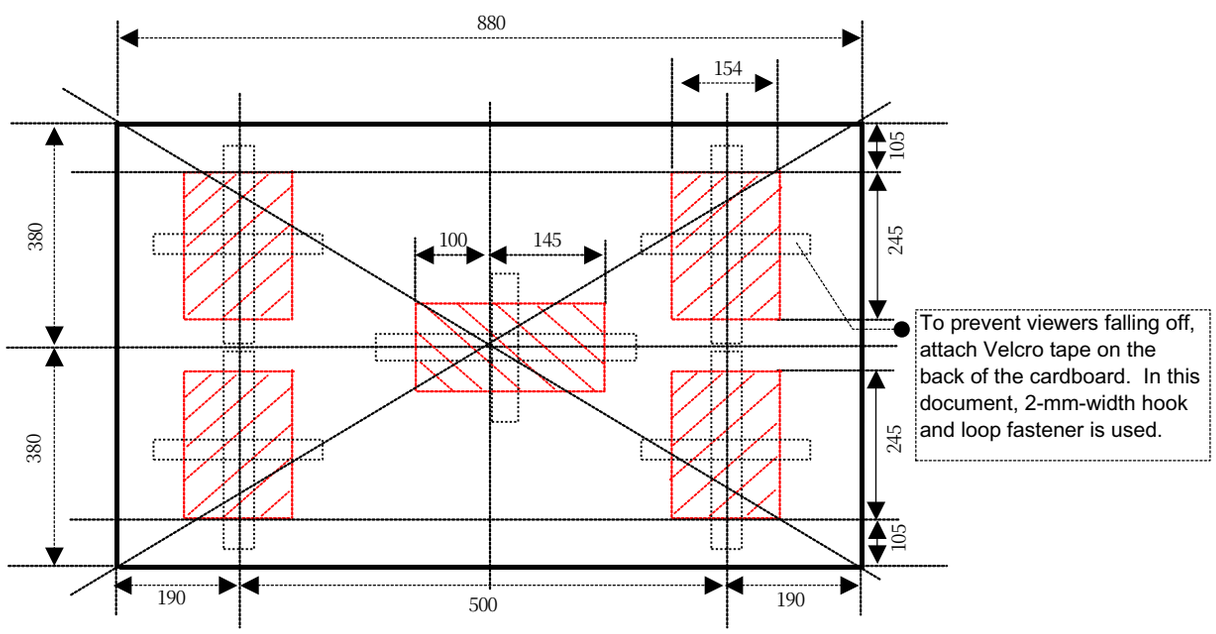
3. Procedure （In this document, 2 package cardboards are used）

3-1: As for the 1st flattened cardboard box (size 2.33), check the positions for embedding the light viewers, and cut out the shape at 5 locations (shaded parts/size 154 x 245 mm) as shown below. —ref. Fig. 2
(Note) Cutting the shape slightly smaller than the actual size of viewers makes it easier to fit the positions of viewers tightly.

3-2: Put the 2nd flattened cardboard box (size 2.33) and the above cut-out 1st cardboard together as one, and fix them by taping at 4 sides. — ref. Fig. 3

3-3: Then as for the 2nd flattened cardboard box, cut out the shape again by matching the cut-out size of 3-1 for each viewer. — ref. Fig. 4

3-4: Reinforce the edges of cut-out parts with tape.
(Note) To prevent viewers falling off, secure them with tape around the edges. — ref. Fig. 5



4. Prevent Viewers from falling off (In this document, 2-mm width Velcro tape is used.)

4-1: As shown above, when viewers are embedded, secure them with square pieces of Velcro tape (hook and loop fastener) on the back of the cardboard to prevent viewers falling off.

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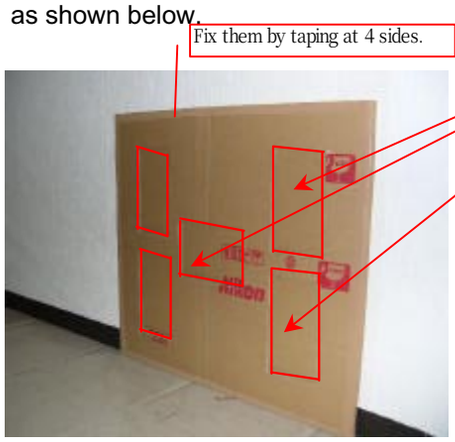
（Fig. 1- Prepare 2 package cardboard boxes, and flatten them as below.）

（Fig. 2 - As for the 1st flattened cardboard box, cut out the <154 x 245 mm sized> shape at 5 locations.）

（Fig. 3- Package cardboard boxes）
Put the 2nd flattened cardboard boxe and the 1st cut-out cardboard together as one as shown below.



（Fig. 4- As for the 2nd flattened cardboard box, cut out the shape in the same way as Fig.2. All cardboards are cut out as below.）

Cut out by matching the size of the 1st cutting.

（Fig. 5- Light viewers are embedded.）

（ Fig. 6 - Chart is attached.）

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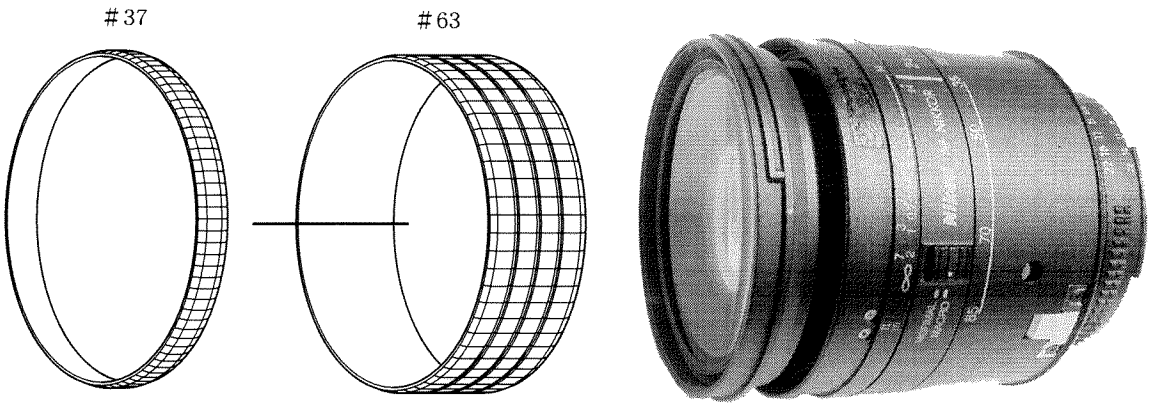
22. RUBBER RING #37、#63



23. F.F.D adjustment (Back focus adjustment)

※ Using the F.F.D adjustment software, input each measured value and calculate each washer's adjusted thickness in order to display them on the PC screen.

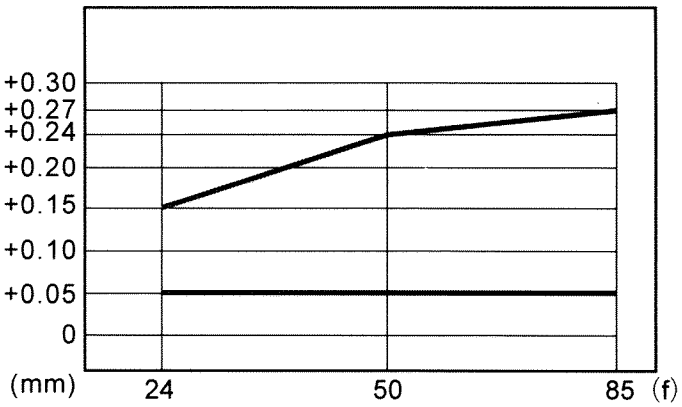
How to adjust

● Start up the adjustment software J18320 and enter each measured value in accordance with the instructions on PC display.

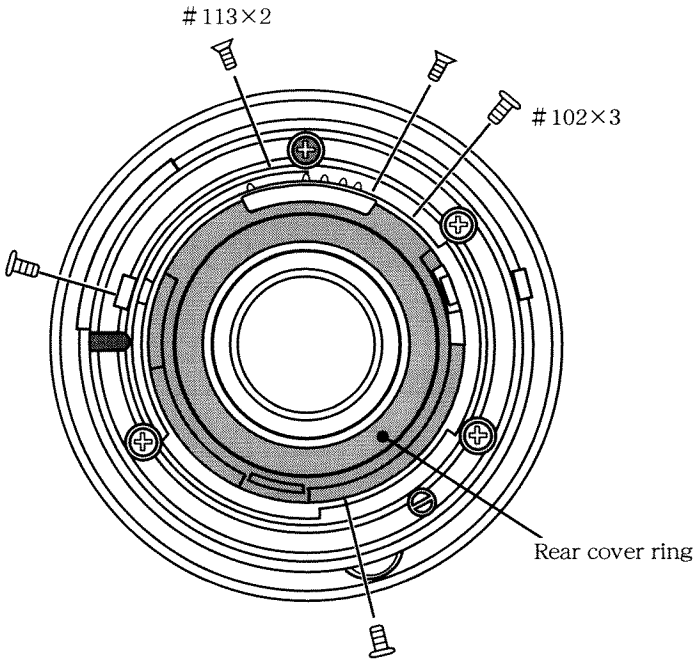
According to the calculated results on the display, adjust each washer's thickness of the first lens group's washer #86, the second lens group's washer #57 and the mount's washer #125.

For the procedure (s), refer to the pages of A12, A14 and A16.

Focal lenght (f)	Standard (mm)
24mm	+0.05 ~ +0.15
50mm	+0.05 ~ +0.24
85mm	+0.05 ~ +0.27



24. REAR COVER RING



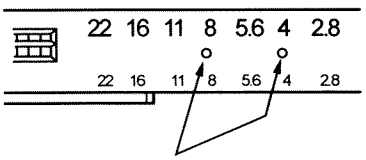
25. Installation of coupling claw

① Take out APERTURE RING (#28).

② Make a 1.1mm hole at 2 concave sections of APERTUER RING.

③ Mount the coupling claw.

Coupling claw	1K406-011	×1
Screw	1K010-002-1	×2



Use these 2 concave sections.

④ Assemble the unit.

26. Projection resolution

△1

For the set up condition and the standard of the lens, please refer to [RESOLUTION REFERENCE] being distributed to the service facilities that has the resolution projector.

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27. Inspection of lens data and encoder signal

※By using the F70 body and the F70 inspection · Adjustment program, display the lens data and encoder signal on the personal computer and inspect them.

How to inspect

· Start the F70 inspection · Adjustment program and select "E. AF lens communication inspection". Hereafter, inspect the lens data and encoder signal according to the displayed instructions.

Encoder signal

· When FOCUSING RING is set in the specified position, the encoder signal should be as shown in the following table.

Zoom ring / Distance scale position	f = 24mm			f = 35mm			f = 50mm			f = 85mm		
	Encoder signal											
	1	2	3	1	2	3	1	2	3	1	2	3
∞	72h	59h	DAh	72h	53h	DAh	72h	77h	DAh	72h	F3h	DAh
2.0m	4Fh	59h	DAh	4Fh	53h	DAh	4Fh	77h	DAh	4Fh	F3h	DAh
1.0m	5Fh	59h	DAh	5Fh	53h	DAh	5Fh	77h	DAh	5Fh	F3h	DAh
0.5m	63h	59h	DAh	63h	53h	DAh	63h	77h	DAh	63h	F3h	DAh
Most close distance position				F6h	53h	DAh	F6h	77h	DAh	F6h	F3h	DAh

If the value of the encoder signal does not meet the value of the table, its cause may be as follows.

- BRUSH is not mounted in the correct position.
- BRUSH or BASE PLATE is faulty.
- The encoder pattern of BASE PLATE is soiled.
- FPC is not mounted in the correct position.

[6.] Tools

Tool No.	Name	Remarks
※ J11273	Screw driver (JAA77451 3rd G)	For AF24-85/2.8-4D
※ J19115	Lens holder for LUCAS	For AF24-85/2.8-4D
※ J18320A	FFD ADJ.FD for AF24-85 (NEC 5inch)	For AF24-85/2.8-4D
※ J18320B	FFD ADJ.FD for AF24-85 (NEC 3.5inch)	For AF24-85/2.8-4D
※ J18320C	FFD ADJ.FD for AF24-85 (IBM 5inch)	For AF24-85/2.8-4D
※ J18320D	FFD ADJ.FD for AF24-85 (IBM 3.5inch)	For AF24-85/2.8-4D

※ New tool

Notes: The service facilities that do not have LUCAS cannot order the lens holder for LUCAS (J19115).